

## Service Guide

# IntelliVue Patient Monitor MP20/MP20Junior/MP30

## Patient Monitoring

**PHILIPS**

Part Number M8001-9301F  
453564112561



**PHILIPS**

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# Introduction

This Service Guide contains technical details for the IntelliVue MP20, MP20 Junior and MP30 Patient Monitor, the Multi-Measurement Module (MMS), the IntelliVue X2, and the Measurement Server Extensions.

This guide provides a technical foundation to support effective troubleshooting and repair. It is not a comprehensive, in-depth explanation of the product architecture or technical implementation. It offers enough information on the functions and operations of the monitoring systems so that engineers who repair them are better able to understand how they work.

It covers the physiological measurements that the products provide, the Measurement Server that acquires those measurements, and the monitoring system that displays them.

## Who Should Use This Guide

This guide is for biomedical engineers or technicians responsible for troubleshooting, repairing, and maintaining Philips' patient monitoring systems.

## How to Use This Guide

This guide is divided into eight sections. Navigate through the table of contents at the left of the screen to select the desired topic. Links to other relevant sections are also provided within the individual topics. In addition, scrolling through the topics with the page up and page down keys is also possible.

## Abbreviations

Abbreviations used throughout this guide are:

Name	Abbreviation
IntelliVue MP20/MP30 Patient Monitor	the monitor
Multi-Measurement Module	MMS

<b>Name</b>	<b>Abbreviation</b>
Measurement Link	MSL
Medical Information Bus	MIB
Anesthetic Gas Module	AGM

## Responsibility of the Manufacturer

Philips only considers itself responsible for any effects on safety, EMC, reliability and performance of the equipment if:

- assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by Philips, and
- the electrical installation of the relevant room complies with national standards, and
- the instrument is used in accordance with the instructions for use.

To ensure safety and EMC, use only those Philips parts and accessories specified for use with the monitor. If non-Philips parts are used, Philips is not liable for any damage that these parts may cause to the equipment.

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# Passwords

In order to access different modes within the monitor a password may be required. The passwords are listed below.

Monitoring Mode: No password required

Configuration Mode: 71034

Demo Mode: 14432

Service Mode: 1345

Consult the configuration guide before making any changes to the monitor configuration.

## Warnings and Cautions

In this guide:

- A **warning** alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.
- A **caution** alerts you where special care is necessary for the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury or damage to the product or other property, and possibly in a remote risk of more serious injury.



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# Theory of Operation

## Monitor Theory of Operation

The IntelliVue MP20/MP20Junior/MP30 Patient Monitor:

- displays real-time data
- controls the attached measurement server
- alarms in the case of patient or equipment problems
- offers limited data storage and retrieval (trending)
- interfaces to the Philips Clinical Network and other equipment

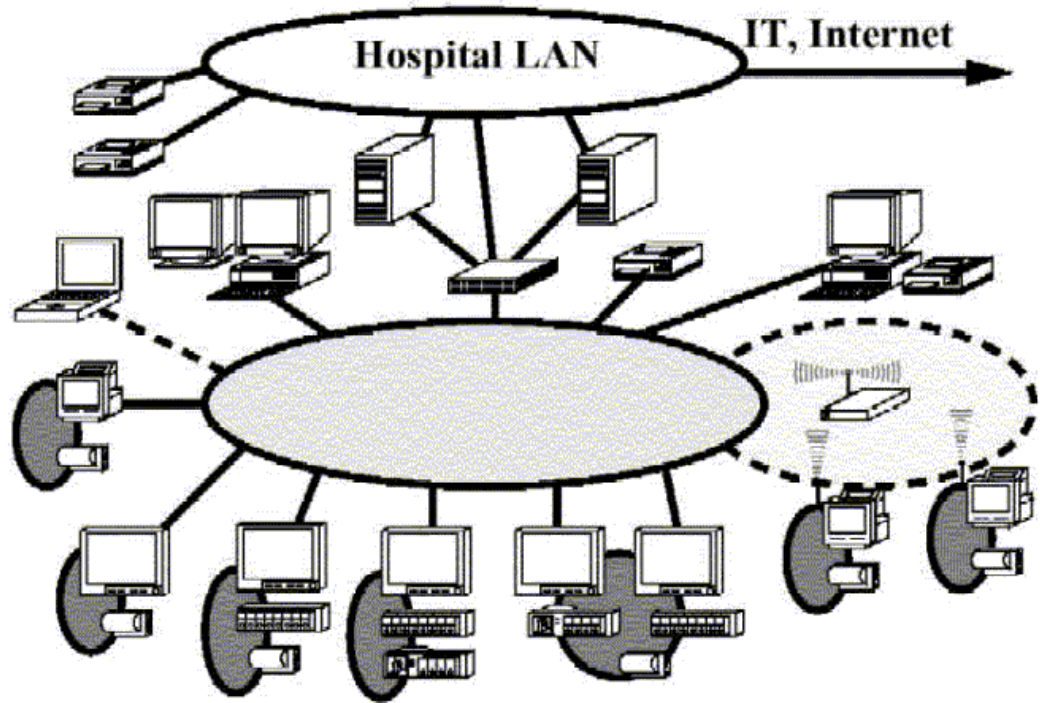
A monitor with just a single integrated measurement server can be connected to additional building blocks to form a monitoring system with a large number of measurements, additional interface capabilities and slave display. These elements cooperate as one single integrated real-time measurement system.

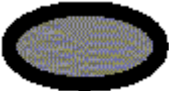



### NOTE

The following descriptions may vary depending on the monitor option purchased.

## System Boundaries

The following diagram discusses specific boundaries within the overall system with respect to their openness and real-time requirements:



	<p>Measurement LAN</p> <p>combines components of one patient monitor; real time requirements across all interconnected elements</p>
	<p>Philips Clinical Network (wired LAN)</p> <p>connects multiple patient monitors, information centers, application servers; closed system, only Philips qualified products (tested and with regulatory approval) are connected, Philips is responsible for guaranteed real-time functionality and performance</p>
	<p>Philips Clinical Network (wireless)</p> <p>like Philips Clinical Network (wired) LAN, however due to current wireless technologies available it has reduced bandwidth, longer latencies, reduced functionality</p>
	<p>Hospital LAN, Internet</p> <p>Standard Network, not under Philips control, no guaranteed service, no real-time requirements</p>

## Hardware Building Blocks

The following hardware building blocks make up the monitoring system:

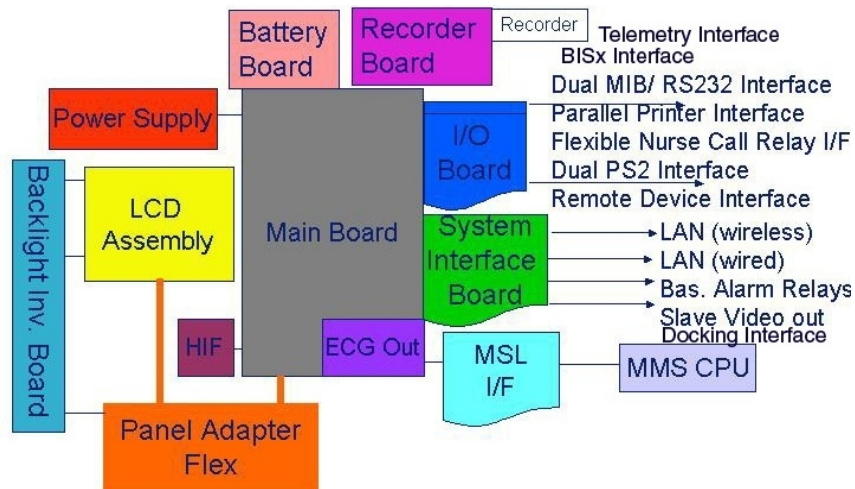


### IntelliVue MP20

The MP20 monitor:

- integrates the display and processing unit into a single package
- uses a 10.4" TFT SVGA color display
- uses the Philips Navigation Point as primary input device; computer devices such as mice, trackball, and keyboard can be added optionally
- supports the MMS and MMS extensions.

#### Building Blocks:

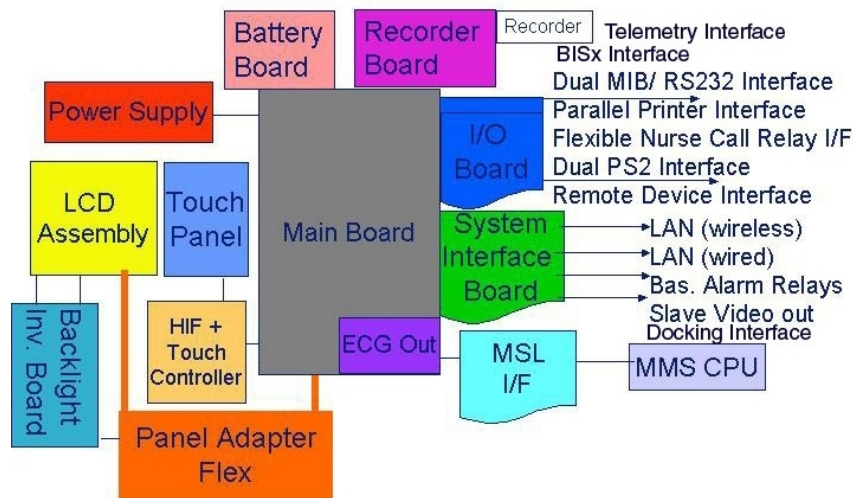


## IntelliVue MP30

The MP30 monitor:

- integrates the display and processing unit into a single package
- uses a 10.4" TFT XGA color display
- uses the Touchscreen and Philips Navigation Point as primary input devices. Computer devices such as mice, trackball, and keyboard can be added optionally.
- supports the MMS and MMS extensions

### Building Blocks:



### Optional Hardware

One slot is provided for one of three available system interface boards. If the monitor is ordered with the wireless LAN option a wireless transmitter is required. For further details regarding the wireless network please refer to the M3185A Philips Clinical Network documentation.

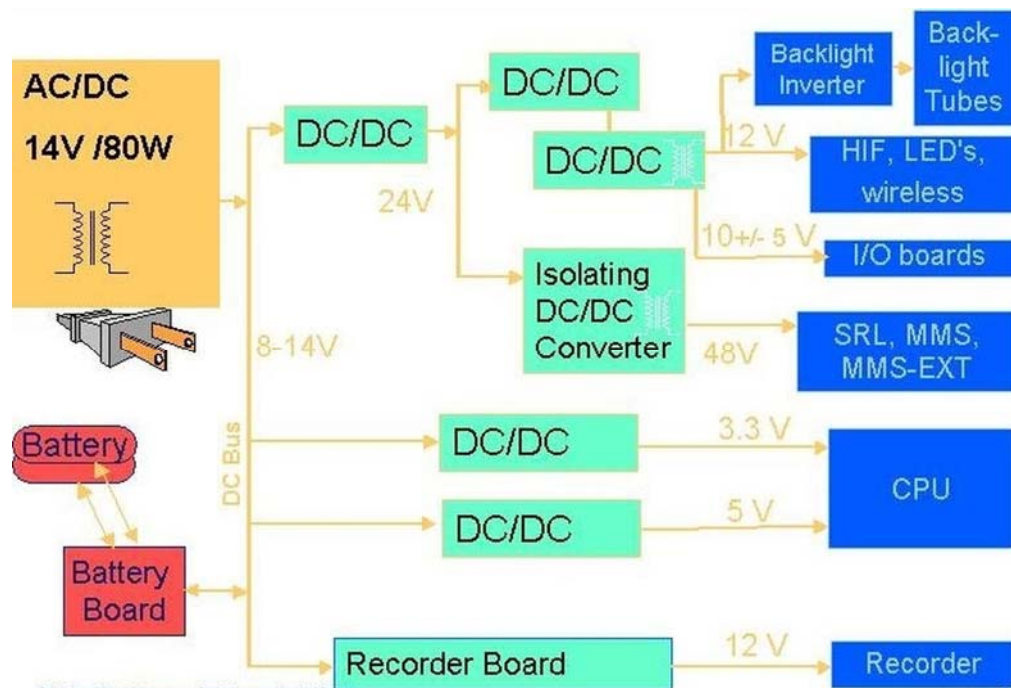


**Compatible Devices*****M8045A Docking Station******M3001A Multi-Measurement Module (MMS)******M3002A IntelliVue X2***



**M3012A, M3014A, M3015A, M3016A MMS Extensions**

### Power Supply



**Power Supply Architecture**

The AC/DC converter transforms the AC power coming from the power plug into 14 V/80W DC source and isolates the monitoring system from the AC power mains. The 14V is distributed via power bus and supplies power to all the components of the system: The 48V DC power needed for the MMS and MMS Extension is created by an isolating DC/DC converter. The power needed for the backlights is converted to 12V DC by the backlight DC/DC converter. The CPU and the non-isolated I/O boards are supplied with 3.3 V and 5 V DC power. Isolated interface boards require a power of 10V AC. The remote HIF board and the LEDs are supplied with 12V DC power.

## CPU Boards

The CPU boards have an MPC852/50 MHz processor in the patient monitor and an MPC860/50MHz in the MMS that provides a number of on-chip, configurable interfaces. An array of fast UARTS with configurable protocol options are implemented in an ASIC (along with other system functions such as independent watchdogs etc.), providing interfacing capabilities to measurement modules and System Interface and I/O boards. The serial interfaces can easily be electrically isolated. The main board contains additional video hardware.

The CPUs provide two LAN interfaces to interconnect CPUs (via the MSL) and to connect to the Philips Clinical Network.

The CPU capabilities are identical. Different loading options are coded on serial EEPROMs to support the automatic configuration of the operating system at boot time.

## System Interface and I/O Boards

Interfaces to the monitor are implemented via I/O boards. The location of these boards is restricted by general rules. The I/O slot designations diagram and the I/O matrix which outline the I/O board placement rules can be found in the *Installation Instructions* section.

The following is a list of Interface (I/O) boards which may be present in your monitor, depending on your purchased configuration:

System Interface boards:

- Video for slave display
- Philips Clinical Network (LAN wired or wireless)
- Basic Alarm Relay (Nurse Call)
- Docking Interface

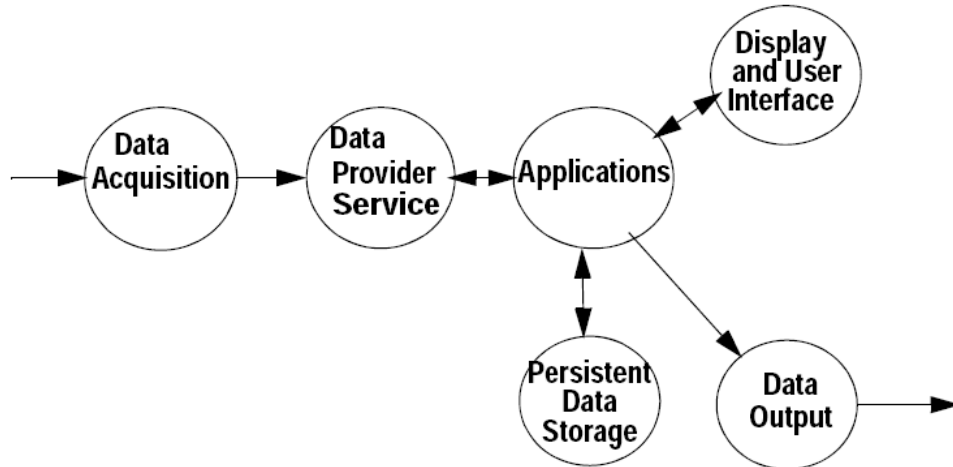
I/O boards:

- PS/2
- MIB/RS232
- Flexible Nurse Call
- Parallel printer
- USB
- Remote devices (Remote Alarm Device, Remote Extension Device)
- BISx Interface
- IntelliVue 802.11 Bedside Adapter

The specifications for the above listed interfaces can be found in the technical data sheet for the monitor and in the *Installation and Specifications* chapter of the Instructions for Use.

## Data Flow

The following diagram shows how data is passed through the monitoring system. The individual stages of data flow are explained below.



## Data Acquisition

Monitoring data (for example patient measurement data in the form of waves, numerics and alerts) is acquired from a variety of sources:

- Measurement Server

The Measurement Server connected to the internal LAN convert patient signals to digital data and applies measurement algorithms to analyze the signals.

- External measurement devices

Data can be also acquired from devices connected to interface boards of the monitor. Software modules dedicated to such specific devices convert the data received from an external device to the format used internally. This applies to the Anesthetic Gas Module.

- Server systems on the Philips Clinical Network

To enable networked applications such as the other bed overview, data can be acquired from server systems attached to the Philips Clinical Network, for example a Philips Information Center

**Data Provider System Service**

All data that is acquired from measurement servers or external measurement devices is temporarily stored by a dedicated data provider system service. All monitor applications use this central service to access the data in a consistent and synchronized way rather than talking to the interfaces directly.

This service makes the applications independent of the actual type of data acquisition device.

The amount of data stored in the data provider system service varies for the different data types. For example several seconds of wave forms and the full set of current numerical values are temporarily stored in RAM.

**Persistent Data Storage System Service**

Some applications require storage of data over longer periods of time. They can use the persistent data storage system service. Dependent on the application requirements, this service can store data either in battery backed-up (buffered) memory or in flash memory. The buffered memory will lose its contents if the monitor is without power (not connected to mains) for an extended period of time. The flash memory does not lose its contents.

The trend application for example stores vital signs data in a combination of flash memory and buffered memory, while the system configuration information (profiles) is kept purely in flash memory.

**Display and User Interface Service**

Applications can use high level commands to display monitoring data or status and command windows on the internal LCD panel. These commands are interpreted by the display manager application. This application controls the dedicated video hardware which includes video memory and a special ASIC.

User input is acquired from a variety of input devices, for example the Navigation Point, the touchscreen or other standard input devices (keyboard, mouse) which may be attached to I/O boards. The system software makes sure that the user input is directed to the application which has the operating focus.

**Data Output**

The monitoring system is very flexible and customizable regarding its data output devices. Built-in devices (for example LAN, alarm lamps, speaker, video) provide the basic output capabilities.

These capabilities can be enhanced by adding additional I/O boards, as required in the specific end-user setup. The additional I/O boards typically provide data to externally attached devices, for example to printers, RS232 based data collection devices, nurse call systems etc.

The monitor can identify I/O boards by means of a serial EEPROM device that stores type and version information. The operating system detects the I/O boards and automatically connects them with the associated (interface driver) application. For some multi-purpose cards it is necessary to configure the card for a particular purpose first (for example the dual MIB/RS232 card can support external touch display, data import, data export).

## Monitor Applications

The monitor applications provide additional system functionality over the basic measurement and monitoring capabilities. This includes for example trending, report generating, event storage or derived measurements.

In general, the monitor applications use the data provider system service to access the measurement data. Application interfaces to the other system services allow the application to visualize data, to store data over extended periods of time or to output data to other devices.

## Internal LAN (Measurement Link)

All components of the monitoring system (including measurement servers and CPUs in the monitor) communicate using an IEEE802.3/ Ethernet LAN in the Measurement Link (MSL). This network is used to distribute data between the components, for example:

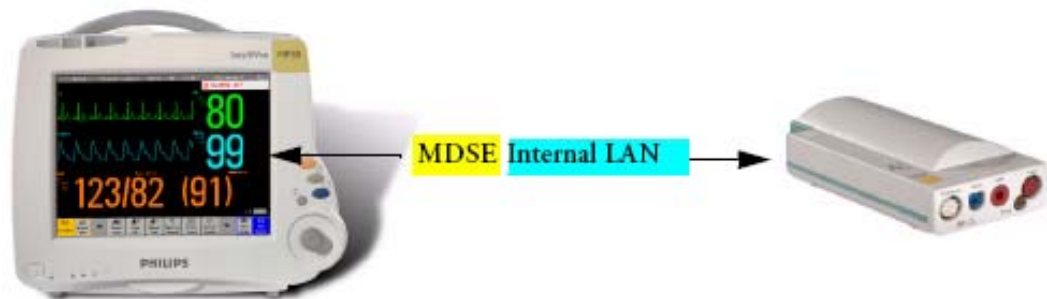
- Digitized patient signals including wave data, numerical data and status information (typically from the measurement server to a display unit)
- Control data representing user interactions (typically from the display unit to a measurement server)
- Shared data structures, for example representing patient demographical data and global configuration items

The internal LAN allows plug and play configuration of the monitoring system. The system automatically detects plugging or unplugging of measurement servers and configures the system accordingly.

The components on the internal LAN are time-synchronized to keep signal data consistent in the system. Dedicated hardware support for synchronization eliminates any latency of the network driver software.

The integrated LAN provides deterministic bandwidth allocation/reservation mechanisms so that the real-time characteristic of signal data and control data exchange is guaranteed. This applies to the data flow from the measurement server to the monitor (for example measurement signal data) and the data flow from the monitor to a measurement server (for example to feed data to a recorder module).

Integrated communication hubs in the monitor allow flexible cabling options (star topology, daisy chaining of servers).



## Philips Clinical Network

The monitoring system may be connected to the Philips Clinical Network, for example to provide central monitoring capabilities or other network services. This connection may be through a normal wired connection or through a wireless connection.

The monitor supports the connection of an external wireless adapter or an internal wireless adapter (#J35). Switching between wired and wireless networks is automatically triggered by the plugging or unplugging of the network cable.

The Philips Clinical Network protocols function very similarly to the protocols used on the internal LAN.

After configuration, the monitoring system sends the digitized patient signals including wave data, numerical data and status information onto the network. Control data representing user interactions can be exchanged between the monitoring system and a central station bi-directionally.

Additional protocols are supported for networked applications, for example for the other bed overview function, which allows viewing of monitoring data from other patients on the network.

For plug and play operation, the monitoring system uses the standard BootP protocol to automatically acquire a network address.

## How does the Support Tool Work with the Monitor

The support tool is a Windows application typically installed on the laptop of a customer engineer or a biomedical engineer working in the customer's own service department.

The purpose of the support tool is to upgrade, configure and diagnose all monitoring components (modules, measurement servers, and monitors) in the system over the network.

The service protocol developed for this purpose uses a raw access to the devices without the need for IP addresses etc. over a standard customer network installation, so that even defective devices can be upgraded as long as the few kBytes of initial boot code are working. The boot code itself can also be upgraded using the same protocol.

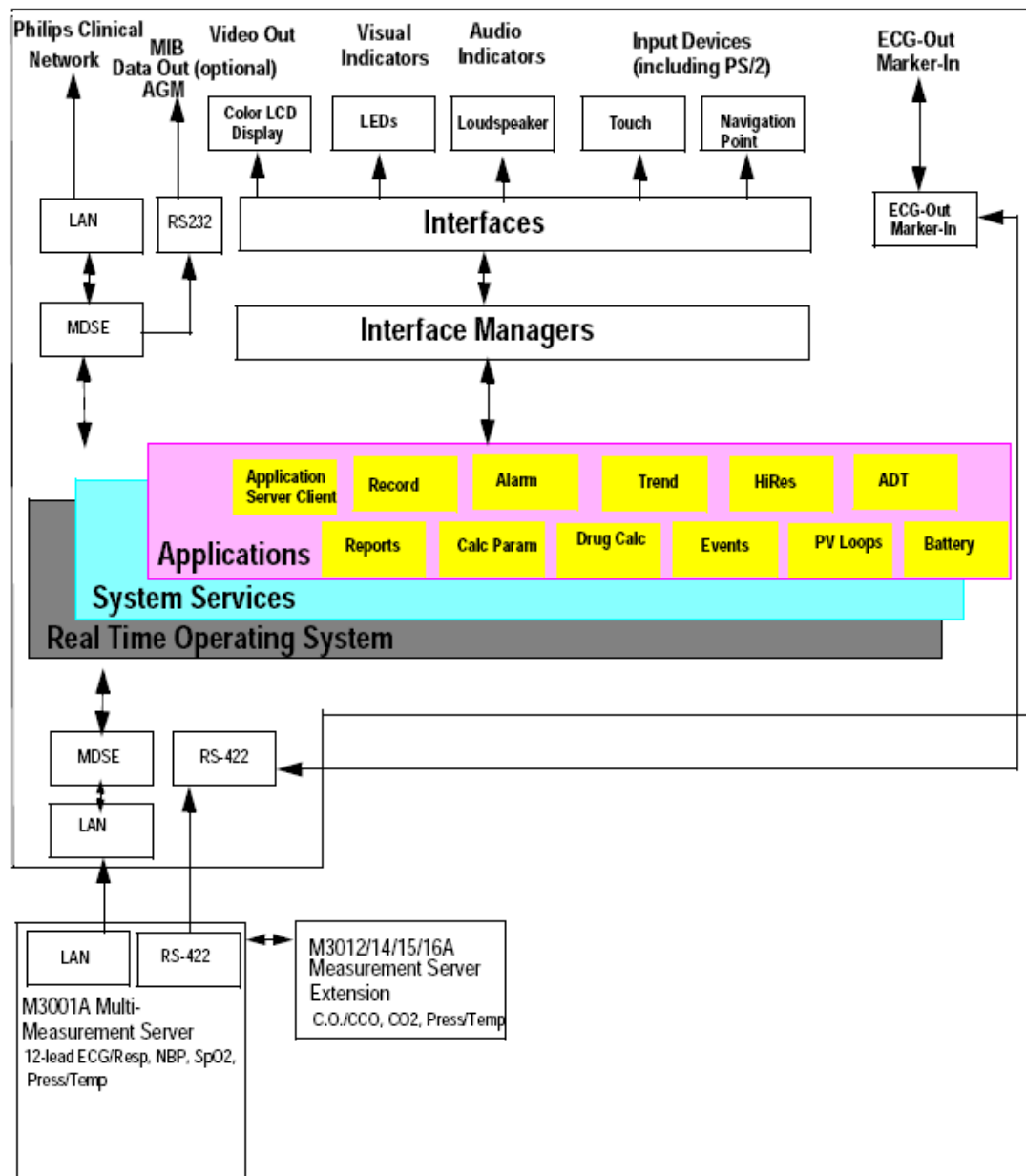
The tool allows access to internal service information and to serial numbers. It can be remote-controlled, for example via a dial-up connection from a response center, provided the proper infrastructure is in place.

For details see the Instructions for Use for the Support Tool.



## Monitor Software Block Diagram

shows the functional block diagram for the monitoring system. A legend explaining terms and diagram elements follows. The information below varies depending on the purchased monitor options.



**IntelliVue Patient Monitoring System Functional Block Diagram**

**Block Diagram Legend**

Functional Block	Description
Services	
Operating System	The Operating System (OS) provides a layer of isolation between the specific hardware implementation and the application software. The OS performs system checks and allocates resources to ensure safe operation when the system is first started. This includes internal self-tests on several hardware modules and configuration checks for validity of configuration with the operating software. During normal operation, the OS continues to run checks on system integrity. If error conditions are detected the OS will halt monitoring operations and inform the operator about the error condition.
System Services	The System Services provide generic common system services. In particular: They use a real-time clock component to track time. They synchronize to network time sources and verify the accuracy of the system time information. They are also responsible for managing persistent user configuration data for all Measurement Servers and IntelliVue Patient Monitoring System software modules. User configuration data is stored in a non-volatile read/write storage device
Applications	
Reports	<p>The Reports Service retrieves current and stored physiological data and status data to format reports for printing paper documentation. The following reports are supported:</p> <ul style="list-style-type: none"> <li>- Vital Signs Report</li> <li>- Graphical Trend Report</li> <li>- Event Review Report</li> <li>- Event Episode Report</li> <li>- ECG Report (12 Lead/Multi-Lead)</li> <li>- Cardiac Output Report</li> <li>- Calculations Report (Hemodynamic/Oxygenation/Ventilation)</li> <li>- Calculations Review Report</li> <li>- Wedge Report</li> <li>- Test Report</li> </ul> <p>The Reports service generates report data which can be printed on a local or a central printer.</p>

Functional Block	Description
Record	The Record Service retrieves current and stored physiological data and status data to format a continuous strip recording. A recording can be triggered manually by the operator or automatically by an alarm condition. The Record Service uses the services of the Recorder Interface to control an M1116B Recorder. The Record Service can also send data to a central recorder.
Alarm	The Alarm Service contains logic that prioritizes alarm conditions that are generated either by the Measurement Servers or by IntelliVue Patient Monitoring System software modules. Visual alarm signals (messages) are displayed at the top of the IntelliVue Patient Monitoring System display and alarm sounds are generated by a loudspeaker. Alarm conditions may be generated when a physiological parameter exceeds preselected alarm limits or when a physiological parameter or any other software module reports an inoperative status (technical alarm, for example, the ECG leads may have fallen off the patient). The Alarm service manages the alarm inactivation states, for example suspension of alarms, silencing of alarms, and alarm reminder. Alarm signals may also be configured as latching (alarm signals are issued until they are acknowledged by the operator, even when the alarm condition is no longer true). The Alarm service controls the visual alarm signals (alarm lamps).
Trend	The Trend service stores the sample values of physiological data and status data with a resolution of 12 seconds, 1 minute or 5 minutes for a period of up to 48 hours. The data is kept in battery buffered read/write storage and flash memory devices to be preserved across power failures. The stored data is protected via consistency checks and checksums. When a new patient is admitted, the trend database erases all data of the previous patient.
HiRes	The OxyCRG (Oxygen CardioRespiroGram) service derives a high-resolution trend graph from the Beat-to-Beat Heart Rate, SpO2 or tcpO2, and Respiration physiological data. The OxyCRG is specialized for neonatal applications, allowing the operator to identify sudden drops in Heart Rate (Bradycardia) and SpO2 (Desaturation), and supporting the operator in visualizing Apnea situations.
ADT	The ADT (Admit/Discharge/Transmit) service maintains the patient demographics information. The operator may admit a new patient, discharge the old patient and enter or modify the patient demographics. The ADT service also supports the transport of a patient (trend database) with the M3001A Multi-Measurement Module. The ADT service controls the deletion of old patient data, the upload of trend data from the M3001A and the switching back of all settings to user defaults. It also synchronizes patient information with a central station on the network.
Calc Param	The Calc Param (Calculated Parameters) service accesses current, stored and manually entered physiological data as input to calculation formulas. With these formulas, derived hemodynamic, oxygenation and ventilation variables are computed. The calculation results, including the input parameters, are stored for later review using the Trend service.

Functional Block	Description
Interface Managers	
MDSE	The MDSE (Medical Data Service Element) Interface Manager is responsible for the exchange of real-time data between the IntelliVue Patient Monitoring System display unit and the Measurement Servers and Flexible Module Rack as well as between the IntelliVue Patient Monitoring System display unit and other devices attached to the network. MDSE establishes and maintains a data communication link between the devices. It provides configuration information about the remote device to applications in the local device and it allows the exchange of measurement data and status information between the devices.
Printer	<p>The Printer Interface Manager provides a high level interface to a printer. It provides means to:</p> <ul style="list-style-type: none"> <li>- establish a connection to the printer</li> <li>- transfer data to the printer</li> <li>- get status of the printer</li> <li>- close connection to the printer</li> </ul> <p>The Printer Interface Manager also supervises the connection to the printer and whether the printer accepts data (for example paper out). The Printer Interface Manager notifies the operator in such cases.</p>
Display & Operator Interface	<p>The Display and Operator Interface Manager performs the following tasks:</p> <ul style="list-style-type: none"> <li>- Screen presentation of real-time and stored physiological measurement data, alarm condition data and status information received from the MDSE interface manager, the Alarm service or other IntelliVue Patient Monitoring System modules</li> <li>- Screen presentation of operating controls (control windows)</li> <li>- Processing of operating control commands received from HIF Control interface. The module verifies and interprets the received commands and forwards them to other software modules of the IntelliVue Patient Monitoring System display unit, Measurement Servers or Flexible Module Rack</li> <li>- Sound generation (issues audible alarm signals and generates audible information signals, for example QRS and SpO2 tones, operator audible feedback)</li> </ul>
Interfaces	
LAN	The LAN interface implements the physical layer of IEEE 802.3. The LAN interface performs Manchester encoding/decoding, receive clock recovery, transmit pulse shaping, jabber, link integrity testing, reverse polarity detection/correction, electrical isolation, and ESD protection. Electronically separated interfaces are used for communication to the Measurement Servers or Flexible Module Rack and to the network.
Centronics	The Centronics interface implements the standard signaling method for bi-directional parallel peripheral devices according to IEEE 1284-I. The interface is used as a parallel interface to a standard printer with electrical isolation and ESD protection.

Functional Block	Description
Display Controller	The Display Controller Interface consists of a video controller chip, video RAM and the controlling software. The Display Controller interface processes the high level display commands (character and graphic generation, wave drawing) and translates them into pixels, which are written into the video RAM where the video controller chip generates the video synchronization signals and the pixel stream for the Color LCD Display.
HIF Control	The HIF (Human Interface Control) interface scans the Human Interface devices for operator controls (Touch Screen, Speed Point, USB and PS/2 devices), formats the collected data and sends it to the display and Operating Interface.
ECG-Out Marker-In	The ECG Out/Marker In interface receives the ECG waveform directly from the ECG/Resp Arrhythmia ST-Segment physiological algorithm via an RS-422 serial interface and converts the digital ECG signal to an analog ECG signal. In addition, the ECG Out controller receives from a connected device the marker information and forwards this data to the ECG/Resp Arrhythmia ST-Segment physiological algorithm. The converted analog signal is used to synchronize a connected device to the patient's ECG
RS-422	The serial link RS-422 interface communicates the ECG signal to the ECG Output/Marker In of the IntelliVue Patient Monitoring System display unit. The interface is a serial, differential, full-duplex link. The interface is ESD protected.
PS/2	The PS/2 interface supports the serial protocol of standard PS/2 devices (mouse). The PS/2 serial protocol is interpreted by the HIF Control interface.
Nurse Call	The Nurse Call board contains 2 connectors. A phone jack type connector and a multi-port connector. The phone jack type connector has a single close-on-alarm relay. The multi-port connector has three alarm relays which are configurable to be open or closed on alarm. In addition, this interface has an audible alert capability for loss of AC power.
MIB	The MIB interface allows full-duplex, short-haul asynchronous binary communication between the monitor and an arbitrary (medical/non-medical) device using an eight-pin RJ45 modular connector. Switching between MIB and RS232 protocol is possible.
Docking Interface	The docking interface provides necessary connections for docking an MP20/30 or MP40/50 monitor onto the docking station.
BISx Interface	The BISx interface allows the usage of Aspect's BISx solution with an MP20/30 monitor.
IIT Interface	The IIT interface allows operation of the MP2/X2/MP5/MP20/MP30/MP40/MP50 monitors with IntelliVue Instrument Telemetry.



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# Testing and Maintenance

## Introduction

This chapter provides a checklist of the testing and maintenance procedures to ensure the performance and safety of the monitor, the Multi-Measurement Module (MMS) and the MMS Extensions.

These tests must be performed only by qualified personnel certified by the responsible organization. Qualifications required are: training on the subject, knowledge, experience and acquaintance with the relevant technologies, standards and local regulations. The personnel assessing safety must be able to recognize possible consequences and risks arising from non-conforming equipment.

All recurring safety and performance assurance tests must be performed under equal environmental conditions to be comparable.

Preventive Maintenance refers specifically to the series of tests required to make sure the measurement results are accurate. The accuracy and performance procedures are designed to be completed as specified in the following sections or when readings are in question.

For detailed instructions on the maintenance and cleaning of the monitor and its accessories, see *Care and Cleaning*, *Using Batteries* and *Maintenance and Troubleshooting* in the monitor's *Instructions for Use*.

# Terminology and Definitions

The following terms and definitions are used throughout this chapter and taken from the international standards IEC 60601-1, IEC 60601-1-1 and IEC 62353.

- **Medical System:** a medical electrical system is a combination of at least one medical electrical device and other electrical equipment, interconnected by functional connection or use of a multiple portable socket-outlet.
- **Patient Vicinity:** any area in which intentional or unintentional contact can occur between the patient and parts of the medical system or between the patient and other persons who have had contact with parts of the medical system. The patient vicinity is defined anywhere within 1.5m (5 feet) of the perimeter of the patient's bed and 2.5m (8.2 feet) from the floor.
- **Separation Device/Transformer:** a component or arrangement of components with input parts and output parts that, for safety reasons, prevent a transfer of unwanted voltage or current between parts of a medical system.
- **Multiple Portable Socket-Outlet:** a combination of two or more socket-outlets intended to be connected to or integrated with flexible cables or cords, which can easily be moved from one place to another while connected to the power mains.
- **Functional Connection:** an electrical connection for transfer of signals and/or power.
- **Tests:** Safety or Performance Assurance test procedures which may consist of several steps.



# Recommended Frequency

Perform the procedures as indicated in the suggested testing timetable. These timetable recommendations do not supersede local requirements.

**Table 1: Suggested Testing Timetable**

Tests		Frequency	
Preventive Maintenance*	NBP Performance	Once every two years, or more often if specified by local laws.	
	Microstream CO <sub>2</sub> Calibration (M3015A)	<b>Once a year</b> or after <b>4000 hours</b> of continuous use and following any instrument repairs or the replacement of any instrument parts.	
Other Regular Tests	Visual Inspection	Before each use.	
	Power On Test		
Performance Assurance Tests	ECG/Resp Performance	Once every two years, or if you suspect the measurement is incorrect, except Mainstream CO2 Accuracy Check, Sidestream CO2 Accuracy Check and Flow Check - required once a year.	
	ECG Sync Pulse Performance		
	SpO2 Performance		
	NBP Performance		
	Invasive Pressure Performance		
	Temperature Accuracy		
	M3014A Capnography Extension Performance Tests		
	Microstream CO <sub>2</sub> Performance Test		
	BIS Performance		
	Nurse Call Relay Performance		
Safety Tests	Visual	Visual Inspection	After each service event.
		Electrical	Protective Earth
	Equipment Leakage Current		
	Patient Leakage Current		
	System Test		Once every two years

\*M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx) also require the CO<sub>2</sub> pump/CO<sub>2</sub> scrubber replacement procedure. This is required every three years or after 15000 operating hours.

## When to Perform Tests

This table tells you when to perform specific tests. The corresponding test procedures are described in the following sections. **All tests listed below must be performed on the monitor itself, any attached MMS/X2 and FMS incl. parameter modules.**

### When to perform tests

Service Event (When performing...	Tests Required ...Complete these tests)
<b>Installation</b>	
<b>Installation</b> of a monitor in combination with a medical or non-medical device connected to the same multiple socket outlet.	Perform Visual Inspection, Power On and System Tests
<b>Installation</b> of a standalone monitor with <b>no</b> display connected to the video output	Perform Visual Inspection and Power On Test
<b>Installation</b> of a monitor with a medical display specified by Philips	Perform Visual Inspection and Power On Test
<b>Installation</b> of a monitor with an off-the-shelf display (non-compliant with IEC60601-1)	Perform Visual Inspection, Power On and System Test
<b>Installation</b> of monitor with IntelliVue Instrument Telemetry (IIT)	Perform Visual Inspection, Power On and IIT communication test
<b>Installation</b> of a monitor with AGM or IntelliVue G1/G5, connected to separate mains sockets.	Perform Visual Inspection and Power On Tests
<b>Installation</b> of a monitor with IT equipment e.g. printer, PC connected via a functional connection e.g. Centronics or USB.	Perform Visual Inspection, Power On and System Tests
<b>Installation</b> of monitor with IntelliVue 802.11 Bedside Adapter	Perform Visual Inspection, Power On and IntelliVue 802.11 Bedside Adapter Communication Test
<b>Installation</b> of networked monitor (LAN)	Perform Visual Inspection and Power On Test
<b>Preventive Maintenance</b>	
Preventive Maintenance*	Perform preventive maintenance tests and procedures: <ul style="list-style-type: none"> <li>- NBP calibration</li> <li>- Microstream CO2 calibration (M3015A)</li> </ul>

Service Event (When performing...	Tests Required ...Complete these tests)
<b>Other Regular Tests and Tasks</b>	
Visual Inspection	Perform Visual Inspection test block
Power On Test	Perform Power On test block
<b>Repairs</b>	
<b>Repairs</b> where the monitor, MMS or X2 have been damaged by impact, liquid ingress, fire, short circuit or electrical surge.	Perform Visual Inspection, Power On, all Safety Tests and Full Performance Assurance Tests
<b>Repairs</b> where the power supply, the mains socket or an interface board is removed or replaced or the protective earth ground connection is disrupted.	Perform Visual Inspection, Power On, all Safety Tests and Basic Performance Assurance Test
<b>Repairs</b> where the unit has been opened (front and back separated).	Perform Visual Inspection, Power On, all Safety Tests and Basic Performance Assurance Test
<b>Repairs</b> of IntelliVue Instrument Telemetry (IIT) Module	Perform Visual Inspection, Power On Test Block and IIT communication test
<b>Repairs</b> of IntelliVue 802.11 Bedside Adapter	Perform Visual Inspection, Power On and IntelliVue 802.11 Bedside Adapter Communication Test
<b>Repairs</b> of the MMS or X2 (all service events where the MMS or X2 have been opened)	Perform Visual Inspection, Power On, all Safety Tests and Basic Performance Assurance Test. If a certain parameter seems suspicious, perform Full Performance Assurance Test for this parameter.
<b>Repairs</b> where the NBP pump of the MMS or X2 has been replaced	Perform Visual Inspection, Power On, all Safety Tests, Basic Performance Assurance Test and NBP Performance Test and Calibration
<b>Repairs</b> of the AGM or IntelliVue G1/G5	Perform Basic Performance Assurance Test. For further testing requirements, see AGM or IntelliVue G1/G5 Service Guide
<b>Repairs</b> where the MMS or X2 has been replaced.	Perform Visual Inspection, Power On and Basic Performance Assurance
<b>Repairs</b> where the printer connected via Centronics or USB I/O board has been replaced.	Perform Visual Inspection, Power On, System Test and Printer Test.

<b>Service Event</b> <b>(When performing...</b>	<b>Tests Required</b> <b>...Complete these tests)</b>
All other IntelliVue Monitoring System repairs (except when power supply is removed)	Perform Visual Inspection, Power On Test and Basic Performance Assurance Test
<b>Performance Assurance</b>	
Basic Performance Assurance	Perform basic performance assurance tests for the respective monitoring system component.
Full Performance Assurance	Perform all accuracy and performance test procedures listed in the following sections. If a particular measurement is in question, perform the measurement performance test only.
<b>Upgrades</b>	
Software <b>Upgrades</b>	Perform Visual Inspection, Power On Test and Basic Performance Assurance Test unless otherwise specified in the Upgrade Installation Notes shipped with the upgrade.
Hardware <b>Upgrades</b>	Perform Visual Inspection, Power On Test and Basic Performance Assurance Test unless otherwise specified in the Upgrade Installation Notes shipped with the upgrade.
Hardware <b>Upgrades</b> where IntelliVue Instrument Telemetry (IIT) is installed	Perform Visual Inspection, Power On Test, Basic Performance Assurance Test and IIT communication Test
Hardware <b>Upgrades</b> where IntelliVue 802.11 Bedside Adapter is installed	Perform Visual Inspection, Power On Test, Basic Performance Assurance Test and IntelliVue 802.11 Bedside Adapter Communication Test
Installation of Interfaces or Hardware <b>Upgrades</b> where the power supply or parameter boards need to be removed.	Perform Visual Inspection, Power On Test, Basic Performance Tests and all Safety Tests
<b>Combining or Exchanging System Components</b>	Perform the System Test for the respective system components

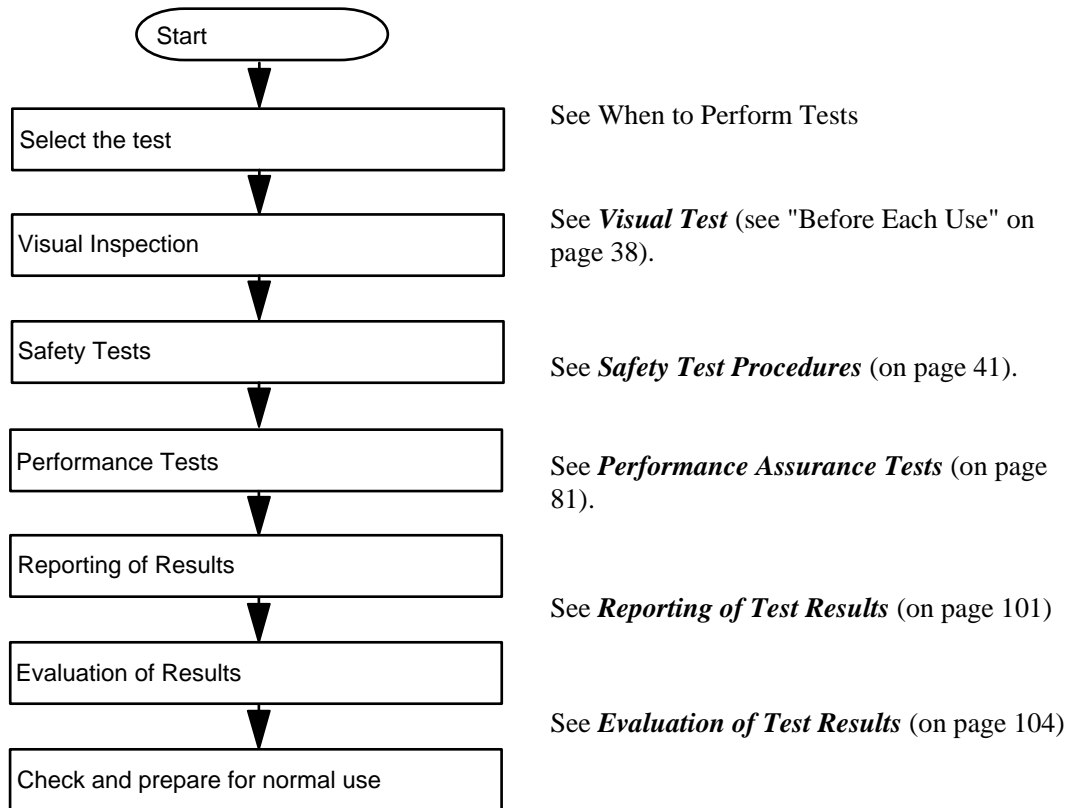
\*M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx) also require the pump and scrubber replacement procedures.

#### NOTE

It is the responsibility of the facility operator or their designee to obtain reference values for recurring safety and system tests. These reference values are the results of the first test cycles after an installation. You may also purchase this service from Philips.

# Testing Sequence

Summary of the recommended sequence of testing:



## NOTE

If any single test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective.

# Visual Inspection

## Before Each Use

Check all exterior housings for cracks and damage. Check the condition of all external cables, especially for splits or cracks and signs of twisting. If serious damage is evident, the cable should be replaced immediately. Check that all mountings are correctly installed and secure. Refer to the instructions that accompany the relevant mounting solution.

## After Each Service, Maintenance or Repair Event

Ensure all fuses accessible from the outside comply with the manufacturer's specification.

Check:

- the integrity of mechanical parts, internally and externally.
- any damage or contamination, internally and externally
- that no loose parts or foreign bodies remain in the device after servicing or repair.
- the integrity of all relevant accessories.

## Power On Test

1. Connect the monitoring system to mains and switch it on. This includes connected displays, MMS, X2, MMS Extensions and gas analyzers.
2. Make sure that all steps listed in the table *Initial Instrument Boot Phase* in the Troubleshooting section are completed successfully and that an ECG wave appears on the screen.

The expected test result is pass: the monitor boots up and displays an ECG wave. The wave might be a flat line if no simulator is attached.

# Safety Tests

Safety tests are comprised of the following tests performed on the monitoring system:

- protective earth resistance
- equipment leakage current
- applied part leakage current
- system test (if required)

Safety test requirements are set according to international standards, their national deviations and specific local requirements. The safety tests detailed in this Service Guide are derived from international standards but may not be sufficient to meet local requirements. We recommend that you file the results of safety tests. This may help to identify a problem early particularly if the test results deteriorate over a period of time.

Each individual piece of equipment of the monitoring system which has its own connection to mains or which can be connected or disconnected from mains without the use of a tool must be tested individually. The monitoring system as a whole must be tested according to the **System Test** (on page 66) procedure.

Accessories of the monitoring system which can affect the safety of the equipment under test or the results of the safety test must be included in the tests and documented.

## Warnings, Cautions, and Safety Precautions

- These tests are well established procedures of detecting abnormalities that, if undetected, could result in danger to either the patient or the operator.
- Disconnect the device under test from the patient before performing safety tests.
- Disconnect the device under test from mains before performing safety tests. If this is not possible, ensure that the performance of these tests does not result in danger to the safety analyzer operator, patients or other individuals.
- Test equipment (for example, a *Safety Analyzer*) is required to perform the safety tests. Please refer to Annex C of IEC/EN 62353 for exact requirements for the measurement equipment and for measurement circuits for protective earth resistance and leakage currents. Refer to the documentation that accompanies the test equipment. Only certified technicians should perform safety testing.
- The consistent use of a *Safety Analyzer* as a routine step in closing a repair or upgrade is emphasized as a mandatory step to maintain user and patient safety. You can also use the *Safety Analyzer* as a troubleshooting tool to detect abnormalities of line voltage and grounding plus total current loads.
- During safety testing, mains voltage and electrical currents are applied to the device under test. Ensure that there are no open electrical conductive parts during the performance of these tests. Avoid that users, patients or other individuals come into contact with touch voltage.
- For Europe and Asia/Pacific, the monitor complies with:  
IEC60601-1:1988 + A1:1991 + A2:1995 = EN60601-1:1990 + A1:1993 + A2:1995  
IEC60601-1-1:2000  
For USA, the monitor complies with:  
UL60601-1  
For Canada, CAN/CSA C22.2#601.1-M90
- Local regulations supersede the testing requirements listed in this chapter.
- If a non-medical electrical device is connected to a medical electrical device, the resulting medical electrical system must comply with IEC/EN 60601-1-1.
- Perform safety tests as described on the following pages.

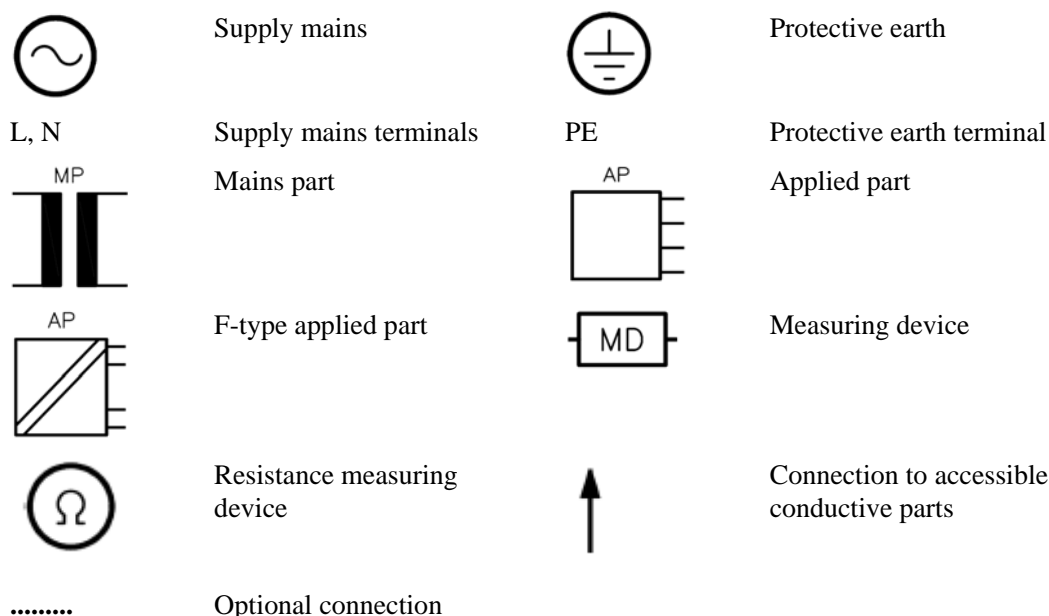


## Safety Test Procedures

Use the test procedures outlined here **only** for verifying safe installation or service of the product. The setups used for these tests and the acceptable ranges of values are derived from local and international standards but may not be equivalent. These tests are not a substitute for local safety testing where it is required for an installation or a service event. If using an approved safety tester, perform the tests in accordance with the information provided by the manufacturer of the tester and in accordance with your local regulations, for example IEC/EN 60601-1, UL60601-1 (US), IEC/EN 62353, and IEC/EN 60601-1-1. The safety tester should print results as detailed in this chapter, together with other data.

Please refer to Annex C of IEC/EN 62353 for requirements for the measurement equipment and for measurement circuits for protective earth resistance and leakage currents.

The following symbols are used in the diagrams illustrating the safety tests:



### CAUTION

#### After each service, maintenance or repair event:

Ensure all fuses accessible from the outside comply with the manufacturer's specification.

Check:

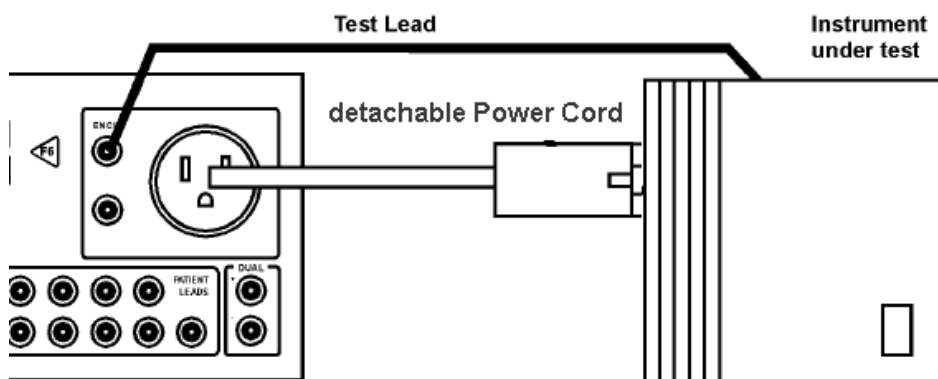
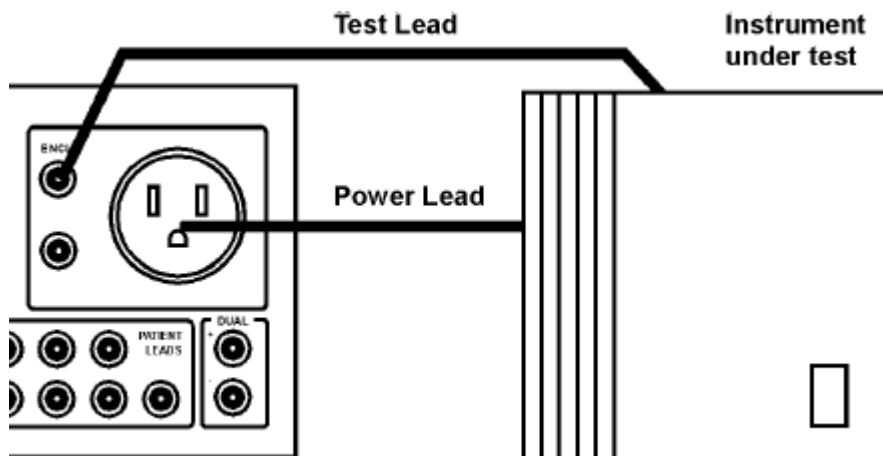
- the integrity of mechanical parts, internally and externally.
- any damage or contamination, internally and externally.
- that no loose parts or foreign bodies remain in the device after servicing or repair.
- the integrity of all relevant accessories.

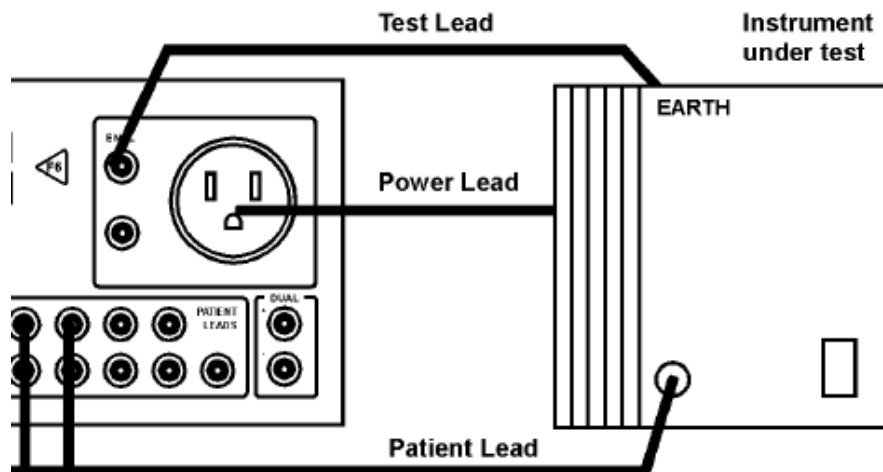
**Hints for Correct Performance of Safety Tests**

- Perform a visual inspection on all detachable power cords used with the monitoring system and include these in all safety test procedures.
- Connection lines such as data lines or functional earth conductors may appear to act like protective earth connections. These may lead to incorrect measurements and need to be considered during testing. If necessary, unplug these connections.
- Position all cables and cords in such a manner that they do not influence the safety tests.
- Measurement of insulation resistance is not required.

**Guideline for Performance of Safety Tests**

Connect the detachable power cord of the device under test to the safety analyzer's test mains port. Connect the enclosure test lead of the safety analyzer to the enclosure of the device under test, e.g. to the equipotential connector. For testing the applied part leakage current, connect all applied parts to the safety analyzer using the appropriate patient lead or adapter cable. For the ECG parameter all ten ECG-leads need to be connected to the safety analyzer. If necessary, use an adapter cable to connect all ten ECG-leads. If necessary, repeat the safety test procedure until all available applied parts have been tested. Refer to the documentation that accompanies the safety analyzer for further details on how to set up and perform the test.

**Protective Earth Resistance Test - Setup Example****Equipment Leakage Current Test - Setup Example**



***Applied Part Current Test - Setup Example***

**NOTE**

The above graphics resemble the Metron QA-90 setup and are protected by copyright. Copyright owned by Fluke (Metron).

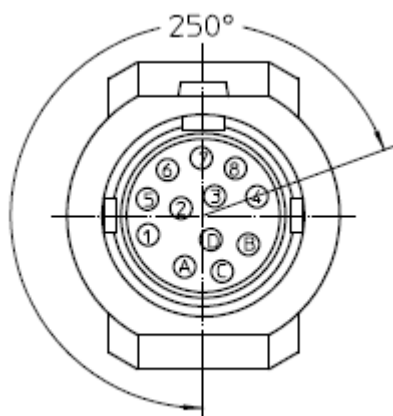
### Safety Test Adapter Cable - Schematics

The following graphics provide schematics of safety test (patient lead) adapter cables which can be used for electrical safety testing. These schematics can also be used as a guideline for making your own safety test adapter cables. Alternatively, other methods to make safety test adapter cables can be used, e.g. using a modified accessory cable.

#### NOTE

You may not need all of the cables displayed below for electrical safety testing of your respective monitor.

ECG:



### Wiring Schematic

PLUG 12-PIN

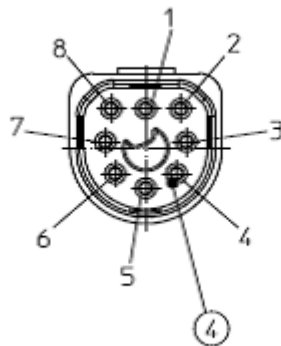
MALE

Conductor Coloring

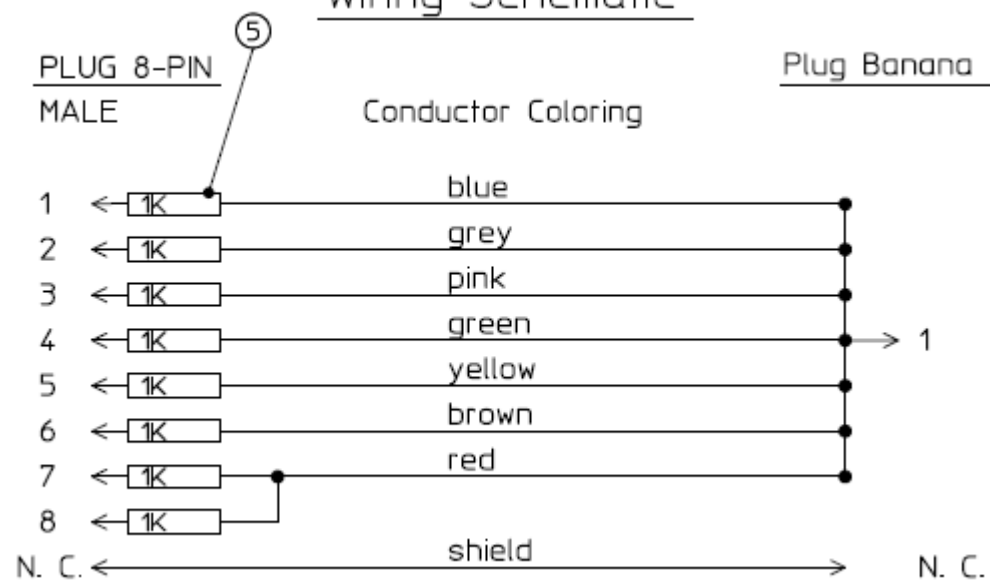
Plug Banana



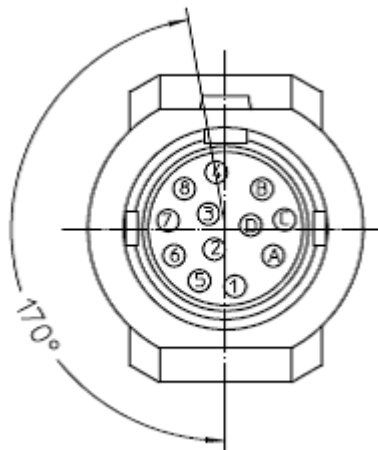
SpO2 (MP2/X2, MP5, M3001A & M1020B #A01, #A02, #A03):



### Wiring Schematic



SpO2 (M1020A):



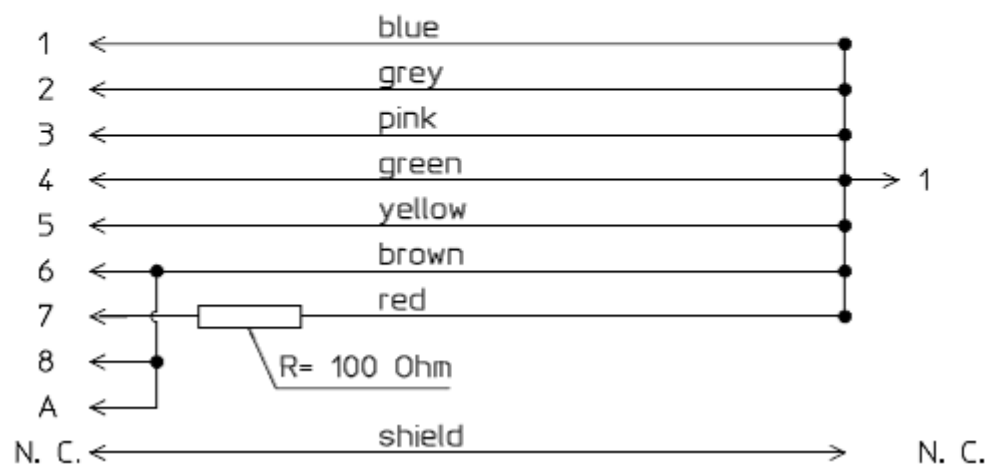
### Wiring Schematic

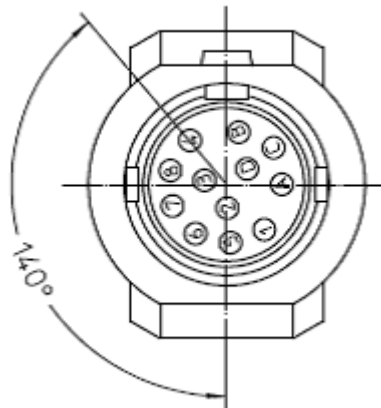
PLUG 12-PIN

MALE

Conductor Coloring

Plug Banana



**Invasive Pressure:**Wiring Schematic

PLUG 12-PIN  
MALE

Conductor Coloring

Plug Banana

**M1006B #C01:**Wiring Schematic

Phone Jack 1/8"  
Stereo

Plug Banana





**Temperature:**Wiring Schematic

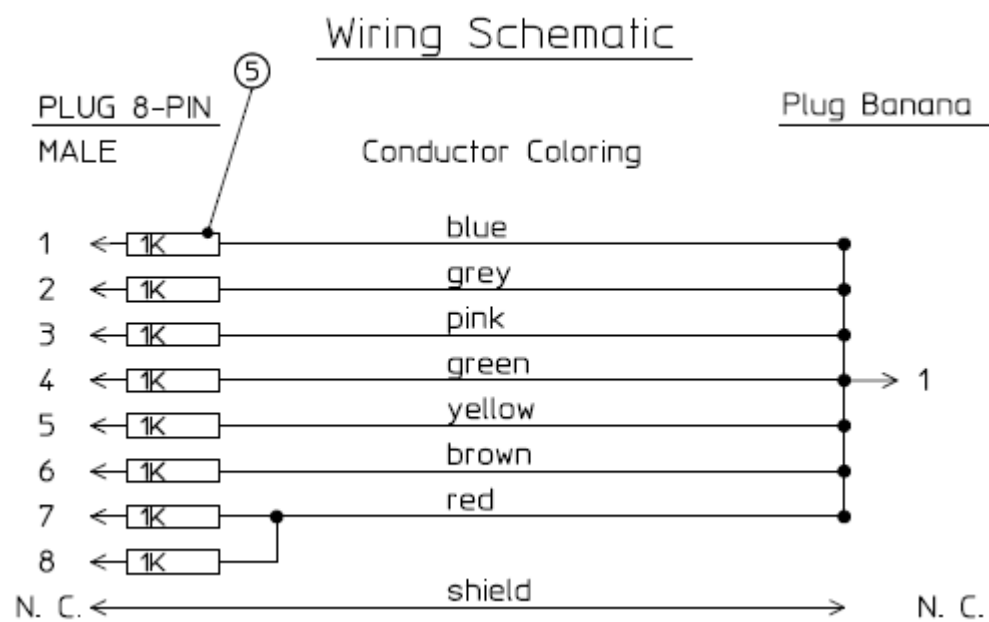
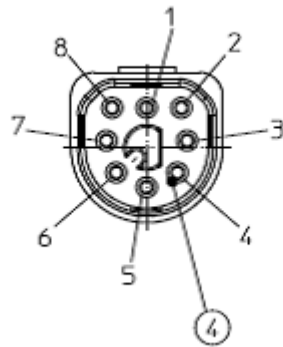
Plug 2-Contact  
Male

Conductor Coloring

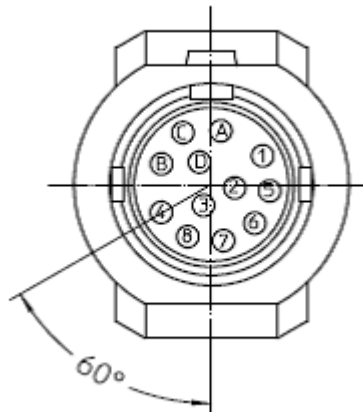
Plug Banana



CO2 (MP5, M3014A):



CO2 (M1016A, M3016A):



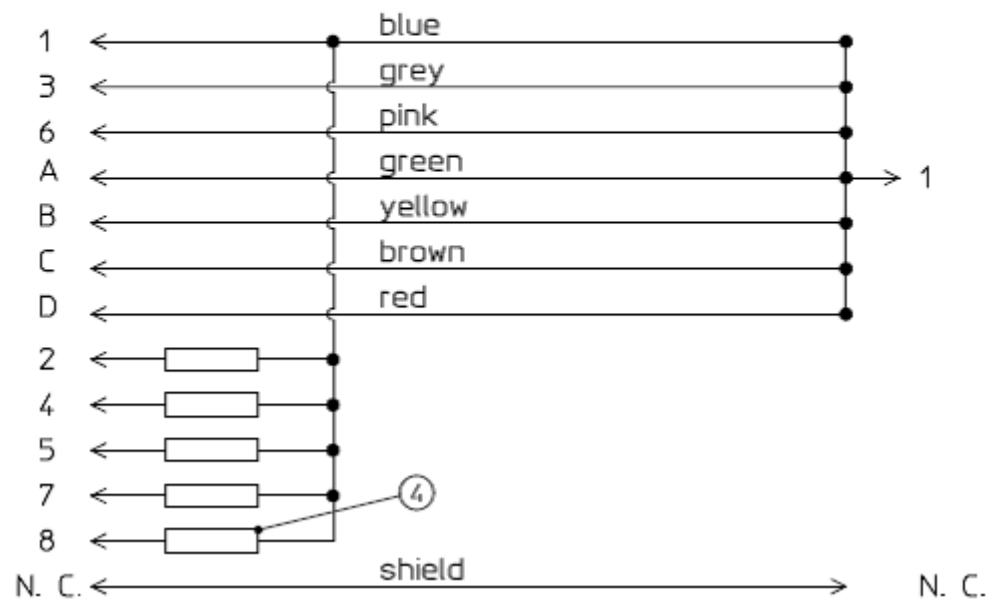
### Wiring Schematic

PLUG 12-PIN

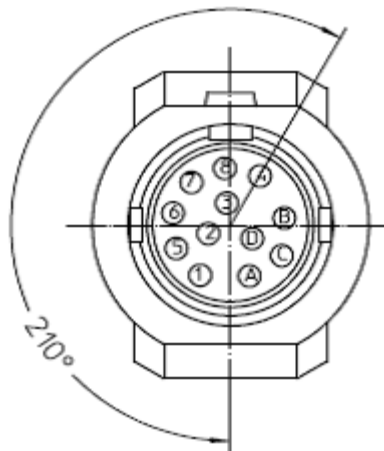
MALE

Conductor Coloring

Plug Banana

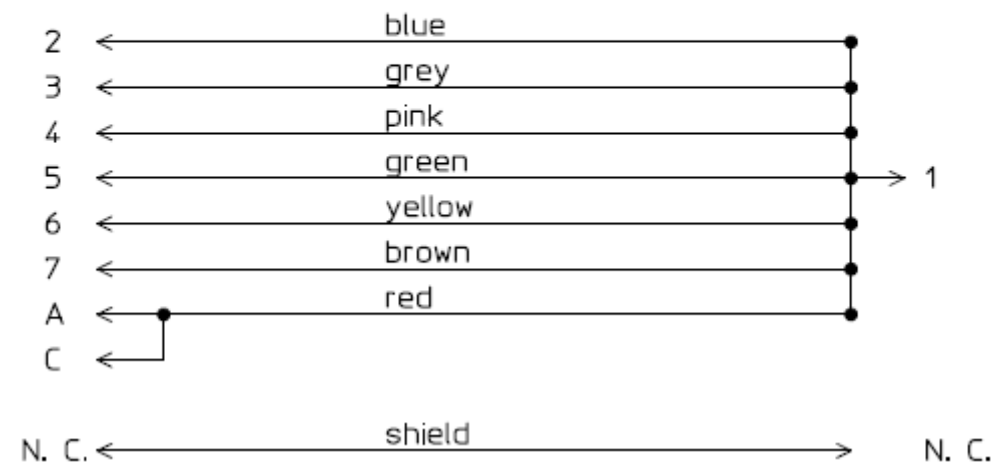


4 = all resistors 120 KOhm

**Cardiac Output:**Wiring SchematicPLUG 12-PIN

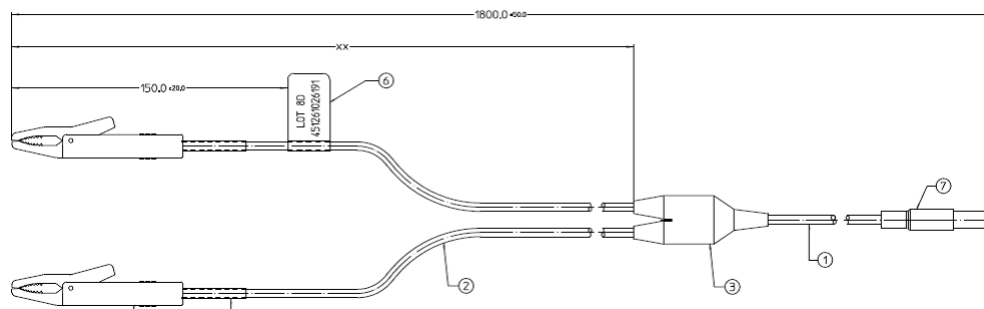
MALE

Conductor Coloring

Plug Banana

**BIS:**

Use Clamp Adapter Cable and M1034-61650 BIS sensor simulator.

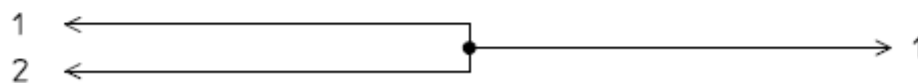


### Wiring Schematic

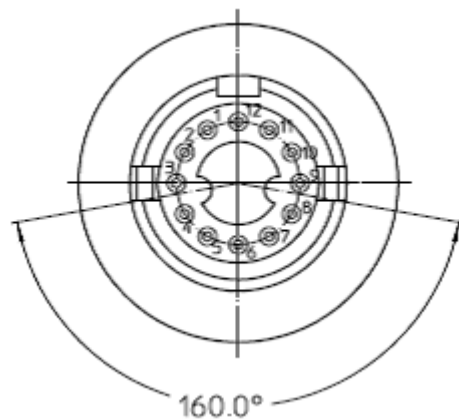
Clamp

Divider

Plug Banana



VueLink:



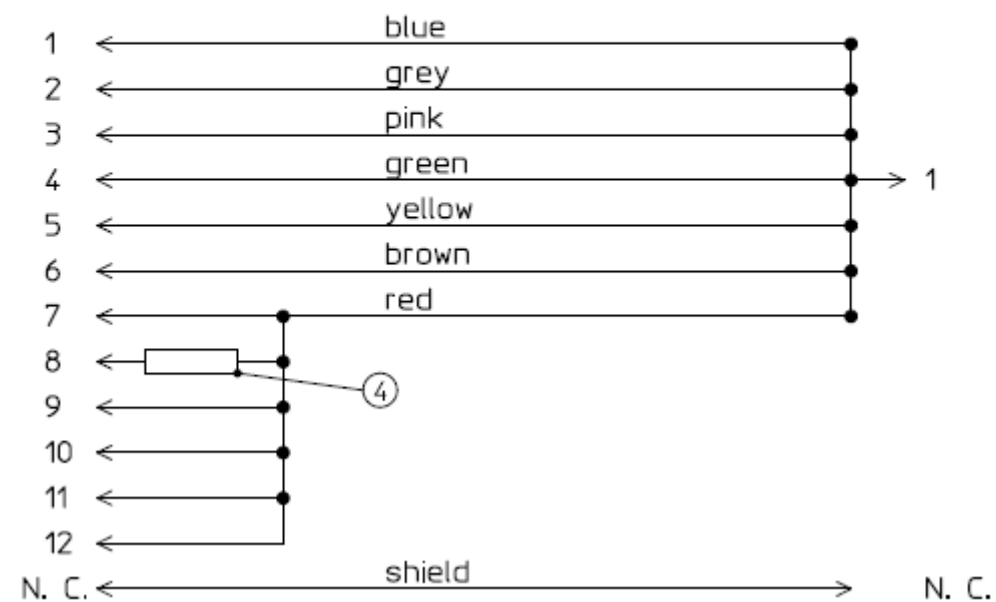
### Wiring Schematic

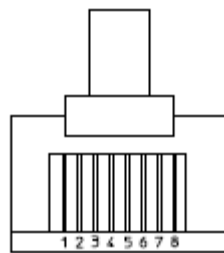
PLUG 12-PIN

MALE

Conductor Coloring

Plug Banana

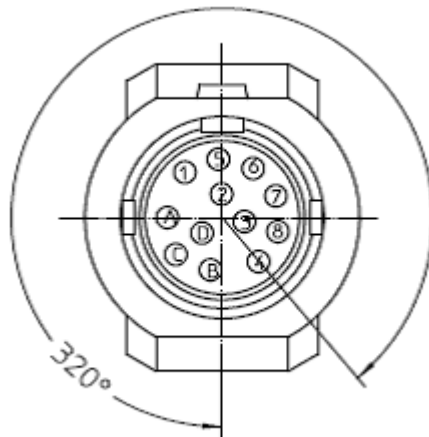


**IntelliBridge:**Wiring SchematicPlug RJ-45Plug Banana

Conductor Coloring



EEG:



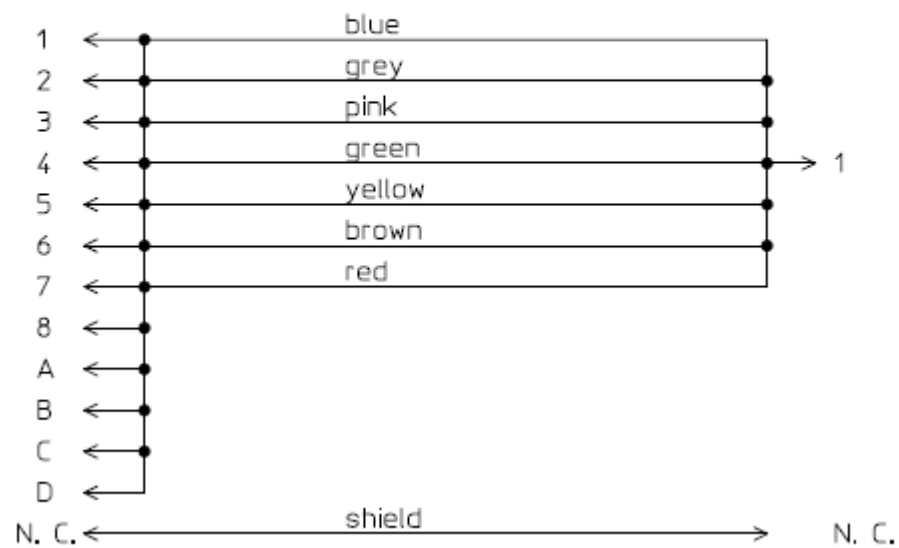
### Wiring Schematic

Plug 12-Contact

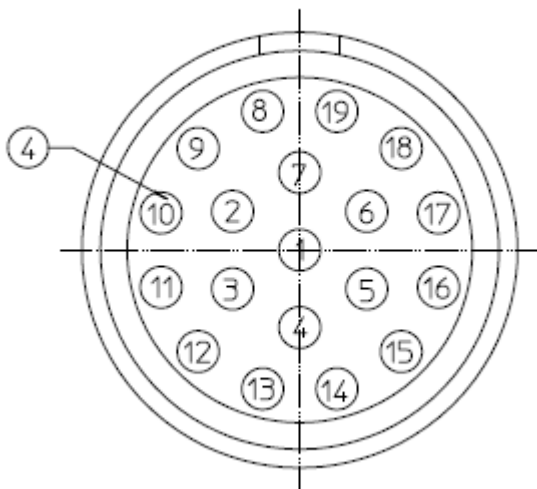
Male

Conductor Coloring

Plug Banana



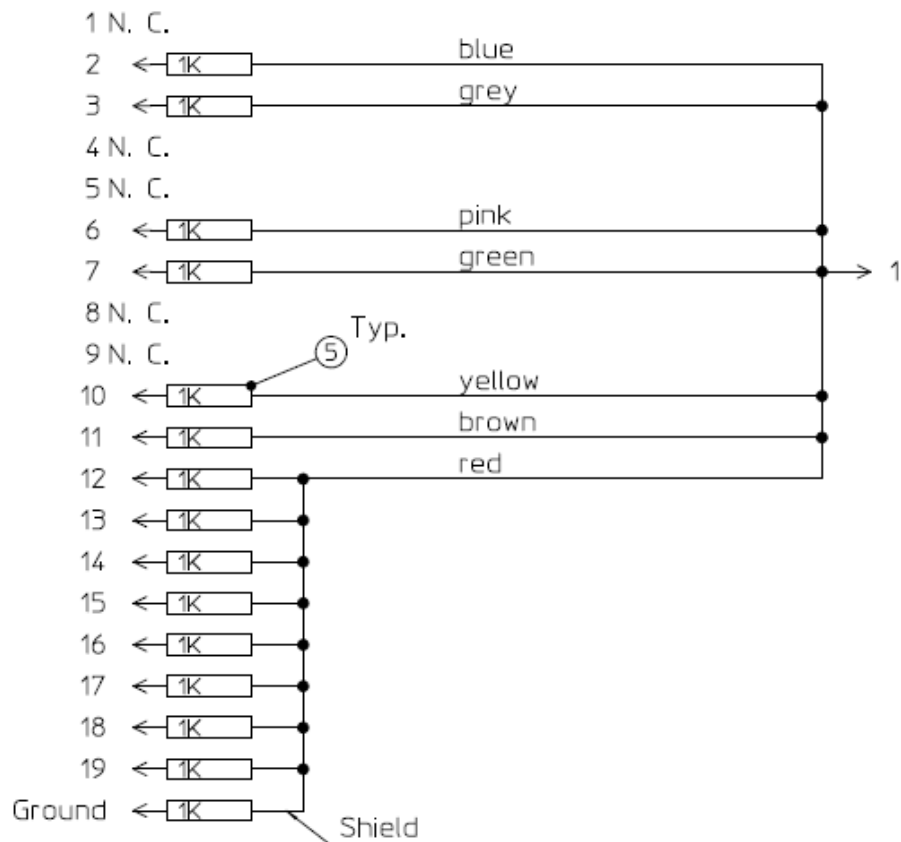


**SvO2 (M1021A):**Wiring Schematic

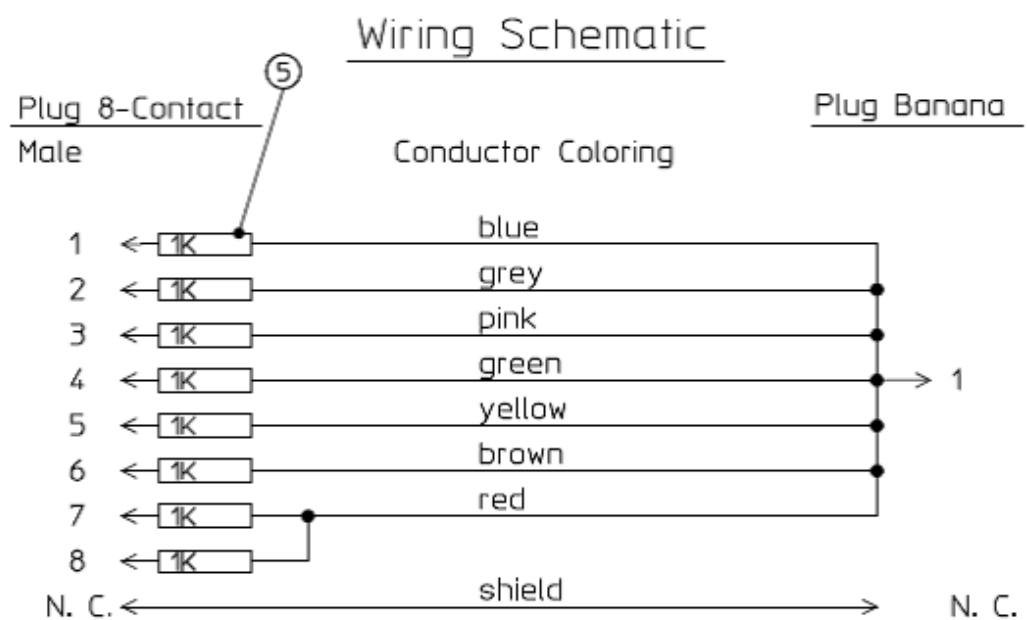
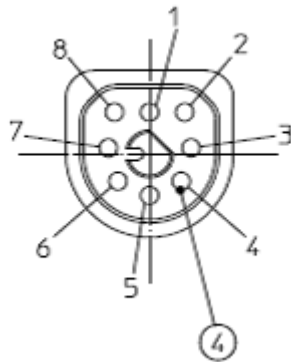
Plug 19-Contact  
Male

Conductor Coloring

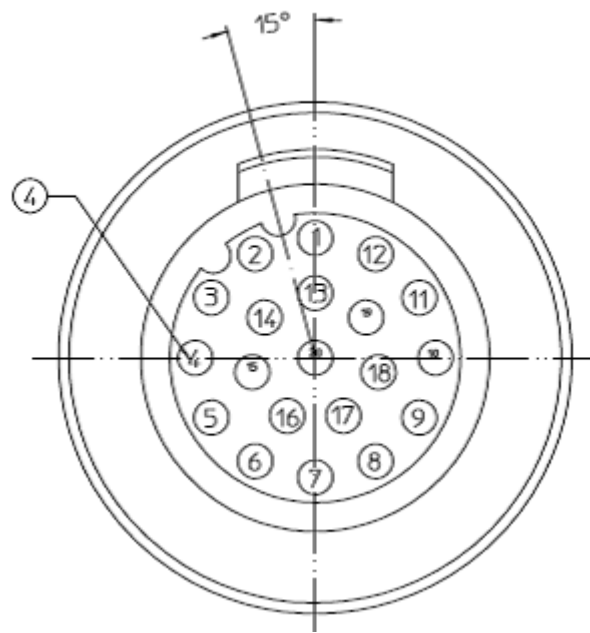
Plug Banana



ScvO2 (M1011A):



tcpO2/tcpCO2:



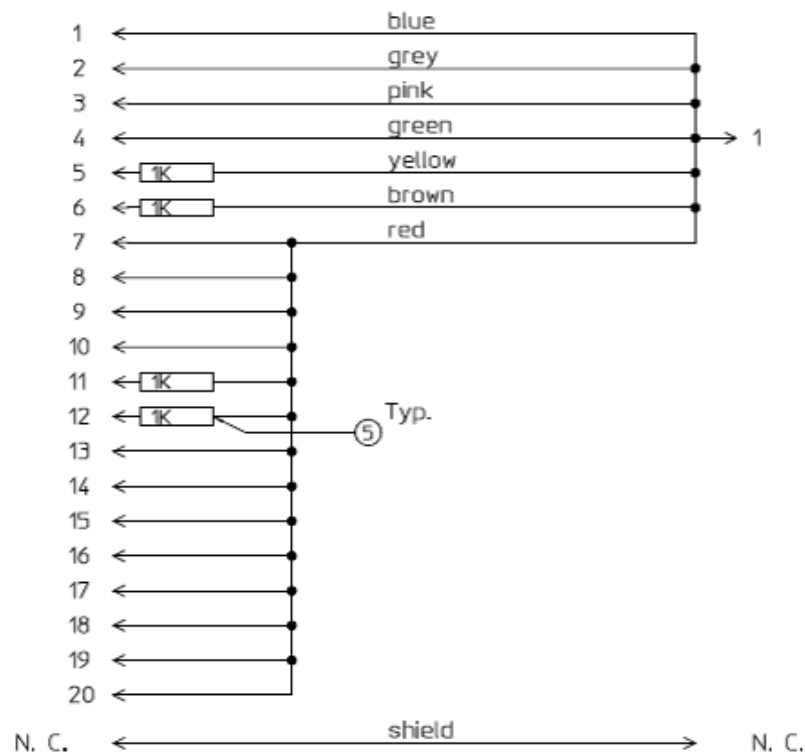
1  
Wiring Schematic

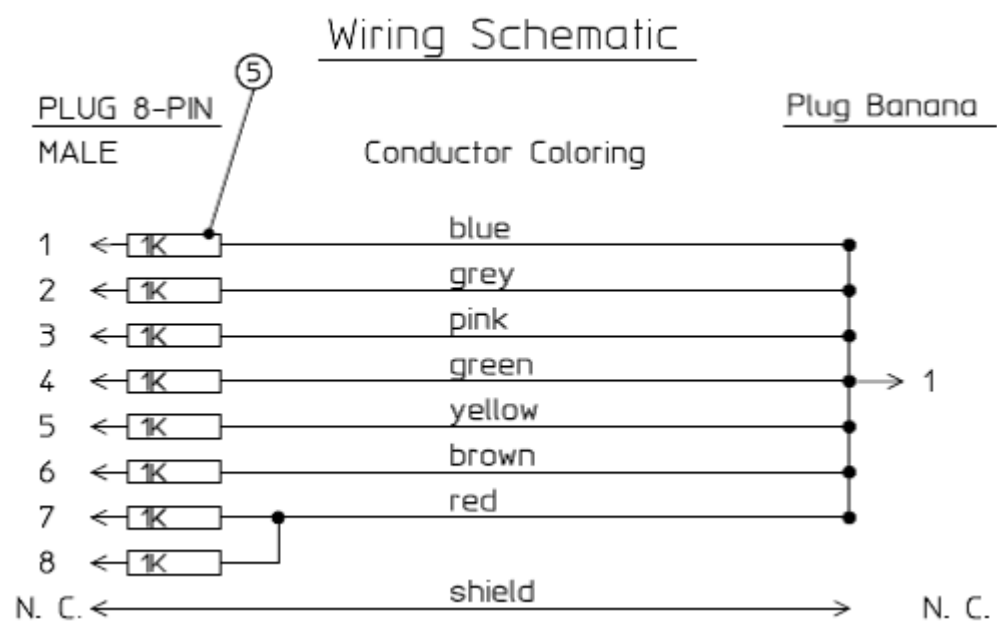
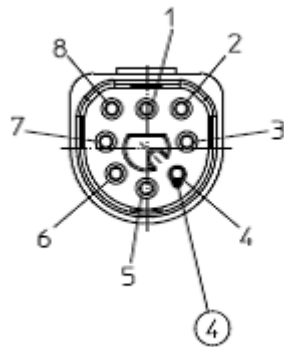
Plug 20-Contact

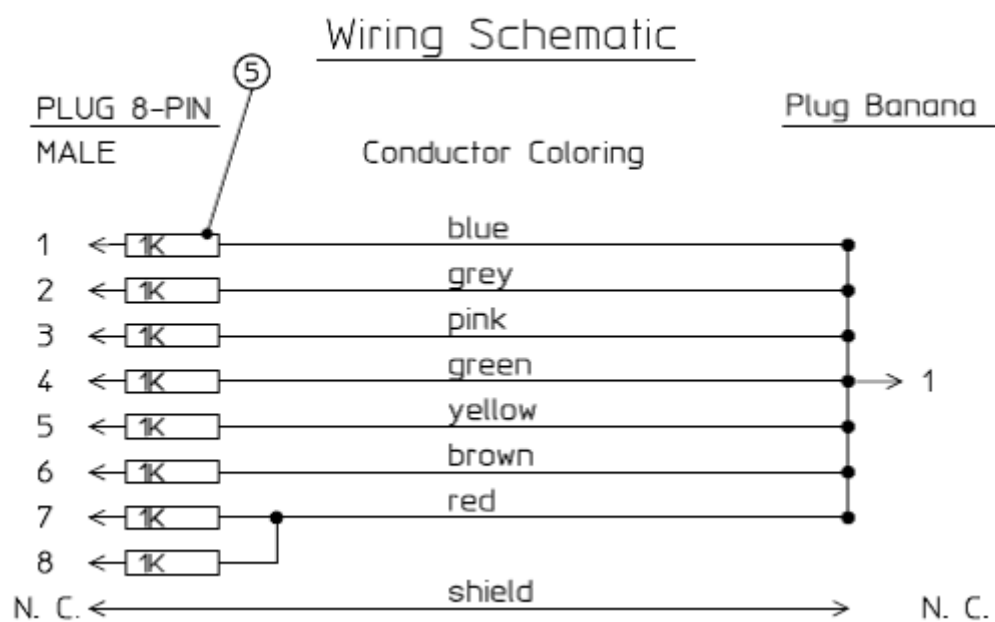
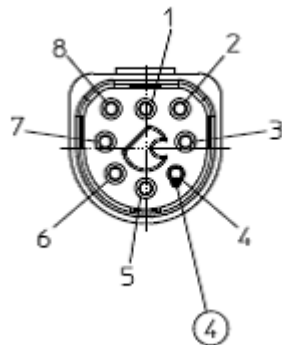
Male

Conductor Coloring

Plug Banana

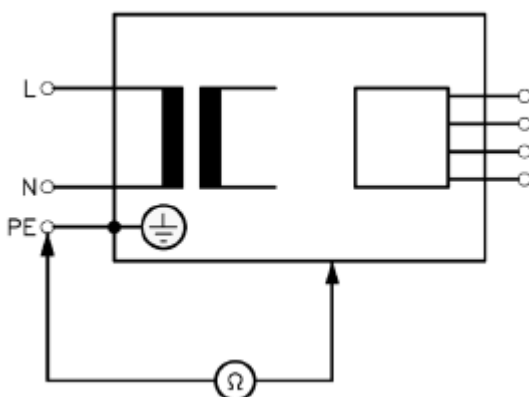


**MP5 predictive Temperature:**

**MP5 TAAP:**

**S(1): Protective Earth Resistance Test**

Test to perform:



**Measuring circuit for the measurement of Protective Earth Resistance in medical electrical equipment that is disconnected from the supply mains.**

This measures the impedance of the Protective Earth (PE) terminal to all exposed metal parts of the Instrument under Test (IUT), which are for safety reasons connected to the Protective Earth (PE).

Measurements shall be performed using a measuring device capable to deliver a current of at least 200 mA into 500 mOhms with maximum 24V

This safety test is based on IEC/EN 60601-1, IEC/EN 62353, *UL2601-1 Ed. 2/UL60601-1:2003* and *CSA 601.1-M90*.

For measurement limits, refer to Safety (1) test, Test and Inspection Matrix.

Report the highest value (X1).

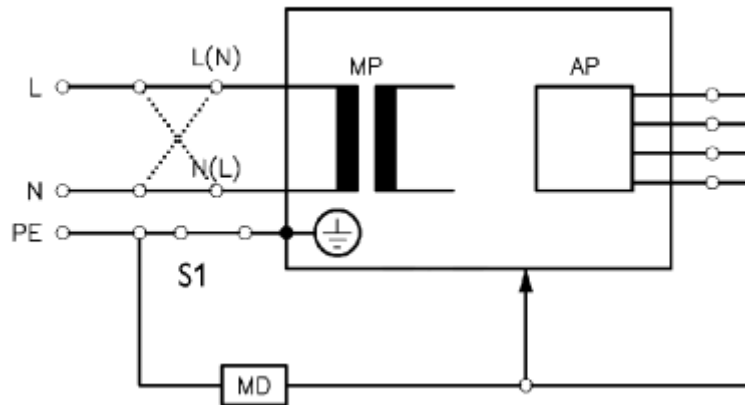
Test	Expected test results
Protective Earth Resistance Test (with mains cable)	X1 ≤ 300mOhms

**NOTE**

- If the protective earth resistance test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective.
- All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.
- Flex the power cord during the protective earth resistance test to evaluate its integrity. If it does not pass the test, exchange the power cord.

**S(2): Equipment Leakage Current Test - Normal Condition**

Test to perform:



**Measuring circuit for the measurement of Equipment Leakage Current - *Direct method* according to IEC/EN 62353.**

This test measures leakage current of exposed metal parts of the monitor and the functional earth leakage current. It tests normal and reversed polarity. Perform the test with S1 closed (Normal Condition).

There are no parts of the equipment that are not protectively earthed.

This safety test is based on IEC/EN 60601-1, IEC/EN 62353, *UL2601-1 Ed. 2/UL60601-1:2003 and CSA 601.1-M90.*

For measurement limits, refer to Safety (2) test, Test and Inspection Matrix.

Report the highest value (X1).

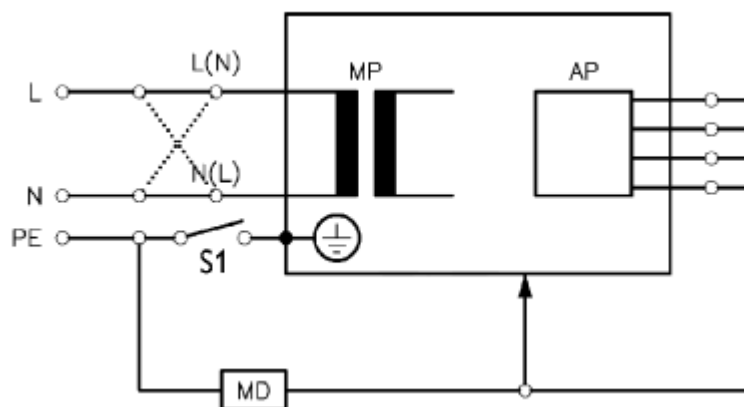
Test	Expected test results
Equipment Leakage Current Test (Normal Condition - with mains cable)	$X1 \leq 100\mu A$

**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

**S(3): Equipment Leakage Current Test - Single Fault Condition**

Test to perform:



**Measuring circuit for the measurement of Equipment Leakage Current - Direct method according to IEC/EN 62353.**

This test measures leakage current of exposed metal parts of the monitor and the functional earth leakage current. It tests normal and reversed polarity. Perform the test with S1 open (Single Fault Condition).

There are no parts of the equipment that are not protectively earthed.

This safety test is based on IEC/EN 60601-1, IEC/EN 62353, *UL2601-1 Ed. 2/UL60601-1:2003 and CSA 601.1-M90*.

For measurement limits, refer to Safety (3) test, Test and Inspection Matrix.

Report the highest value (X2).

Test	Expected test results
Equipment Leakage Current Test (Single Fault Condition - with mains cable)	$X2 \leq 300\mu A$

**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.



**S(4): Applied Part Leakage Current - Mains on Applied Part****NOTE**

During measurement of the Applied Part Leakage Current it is possible that the measured current can exceed the allowed limit (per IEC/EN 60601-1 or IEC/EN 62353).

This can occur when the safety tester is connected to the invasive blood pressure and temperature connectors at the same time during the applied leakage current measurement.

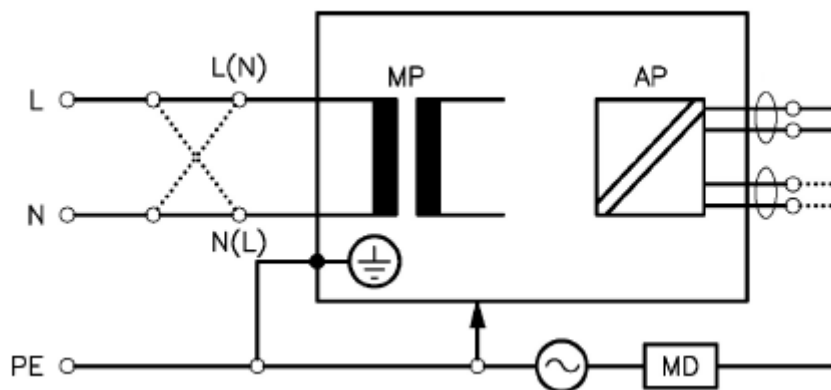
The connectors for the invasive blood pressure and temperature are independently functioning connectors.



Although there are individual connectors on the front end, internally those parameters use the same electrical insulation interface and are hardwired to each other. This results in an electrical short of those connectors during measurement if a test current is applied simultaneously. Therefore this should be avoided.

Due to the combined insulation interface, it is sufficient to connect to only one parameter interface (that is, Invasive Blood Pressure or Temperature) of the invasive blood pressure/temperature measurement block. This avoids a short and the potential of exceeding the limit for the current.

Test to perform:



**Measuring circuit for the measurement of Applied Part Leakage Current - *Direct method* according to IEC/EN 62353.**

This test measures applied part leakage current from applied part to earth caused by external main voltage on the applied part. Each polarity combination possible shall be tested. This test is applicable for ECG measurement inputs.

There are no parts of the equipment that are not protectively earthed.

This safety test is based on IEC/EN 60601-1, IEC/EN 62353, *UL2601-1 Ed. 2/UL60601-1:2003 and CSA 601.1-M90*.

For measurement limits and test voltage, refer to Safety (4) test, Test and Inspection Matrix.

Report the highest value. (X1).

Test	Expected test results
Applied Part Leakage Current Test (Single Fault Condition - mains on applied part)	S4 $\leq$ 50 $\mu$ A

**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

## System Test

After mounting and setting up a system, perform system safety tests according to IEC/EN 60601-1-1.

### What is a Medical Electrical System?

A medical electrical system is a combination of at least one medical electrical piece of equipment and other electrical equipment, interconnected by functional connection or use of a multiple portable socket-outlet.

- Devices forming a medical electrical system must comply with IEC/EN 60601-1-1.
- Any electrical device such as IT equipment that is connected to the medical electrical equipment must comply with IEC/EN 60601-1-1 and be tested accordingly.

## General Requirements for a System

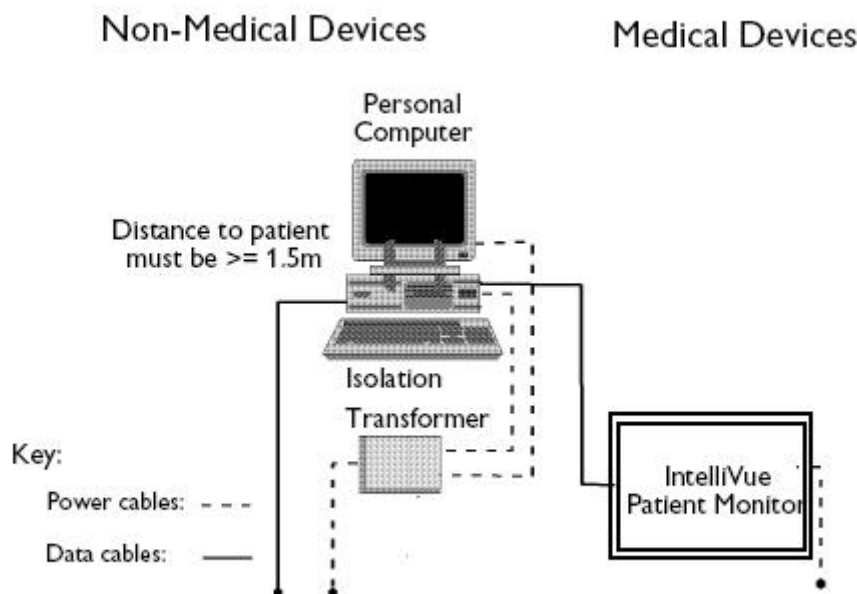
After installation or subsequent modification, a system must comply with the requirements of the system standard IEC/EN 60601-1-1. Compliance is checked by inspection, testing or analysis, as specified in the IEC/EN 60601-1-1 or in this book.

Medical electrical equipment must comply with the requirements of the general standard IEC/EN 60601-1, its relevant particular standards and specific national deviations. Non-medical electrical equipment shall comply with IEC safety standards that are relevant to that equipment.

Relevant standards for some non-medical electrical equipment may have limits for equipment leakage currents higher than required by the standard IEC/EN 60601-1-1. These higher limits are acceptable only outside the patient environment. It is essential to reduce equipment leakage currents to values specified in IEC 60601-1 when non-medical electrical equipment is to be used within the patient environment.

## System Example

This illustration shows a system where both the medical electrical equipment and the non-medical electrical equipment are situated at the patient's bedside.



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**WARNING**

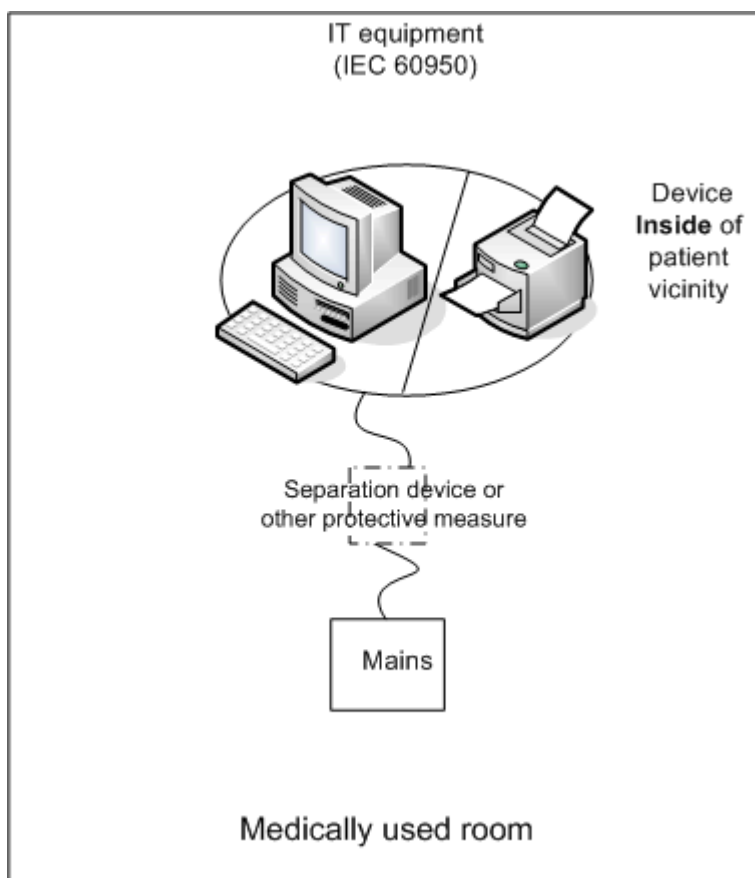
- Do not use additional AC mains extension cords or multiple portable socket-outlets. If a multiple portable socket-outlet is used, the resulting system must be compliant with IEC/EN 60601-1-1. Do not place multiple socket-outlets on the floor. Do not exceed the maximum permitted load for multiple socket-outlets used with the system. Do not plug additional multiple socket outlets or extension cords into multiple socket outlets or extension cords used within the medical electrical system.
  - Do not connect any devices that are not supported as part of a system.
  - Do not use a device in the patient vicinity if it does not comply with IEC/EN 60601-1. The whole installation, including devices outside of the patient vicinity, must comply with IEC/EN 60601-1-1. Any non-medical device placed and operated in the patient's vicinity must be powered via a separating transformer (compliant with IEC/EN 60601-1-1) that ensures mechanical fixing of the power cords and covering of any unused power outlets.
-

## System Installation Requirements

- Ensure that the the medical electrical system is installed in a way that the user achieves optimal use.
- Make sure the user is informed about the required cleaning, adjustment, sterilization and disinfection procedures listed in the Instructions for Use.
- The medical electrical system must be installed in such a way that the user is able to carry out the necessary cleaning, adjustment, sterilization and disinfection procedures listed in the Instructions for Use.
- Ensure that the medical electrical system is installed in a way that an interruption and restoration of power to any part of the medical electrical system does not result in a safety hazard.
- We recommend using fixed mains socket outlets to power the medical system or parts thereof. Avoid using multiple portable socket-outlets.
- Any multiple portable socket outlets used must be compliant with IEC 60884-1 and IEC 60601-1-1.
- Ensure that any part of the system connected to multiple portable socket-outlets is only removable with a tool, i.e. the multiple portable socket-outlet provides a locking mechanism to prevent power cords from being plugged or unplugged unintentionally. Otherwise, the multiple portable socket-outlet must be connected to a separation device. Multiple Socket Outlets used within the medical electrical system must only be used for powering medical electrical equipment which is part of the system.
- Ensure that any functional connections between parts of the medical electrical system are isolated by a separation device according to IEC 60601-1-1 to limit increased equipment leakage currents caused by current flow through the signal connections. This only works if the equipment leakage current of the respective medical electrical system parts is not exceeded under normal conditions.
- Avoid increase of equipment leakage currents when non-medical electrical equipment within the medical electrical system is used. This only works if the equipment leakage current of the respective medical electrical system parts is not exceeded under normal conditions. Use additional protective earth connection, separation device or additional non-conductive enclosures.
- Within the patient environment it is important to limit electrical potential differences between different parts of a system. If necessary, use potential equalization equipment (equipotential cable) or additional protective earth connections.
- Medical electrical equipment used in medical rooms must be connected to potential equalization equipment (equipotential cable) to avoid electrical potential differences. Check your local requirements for details.

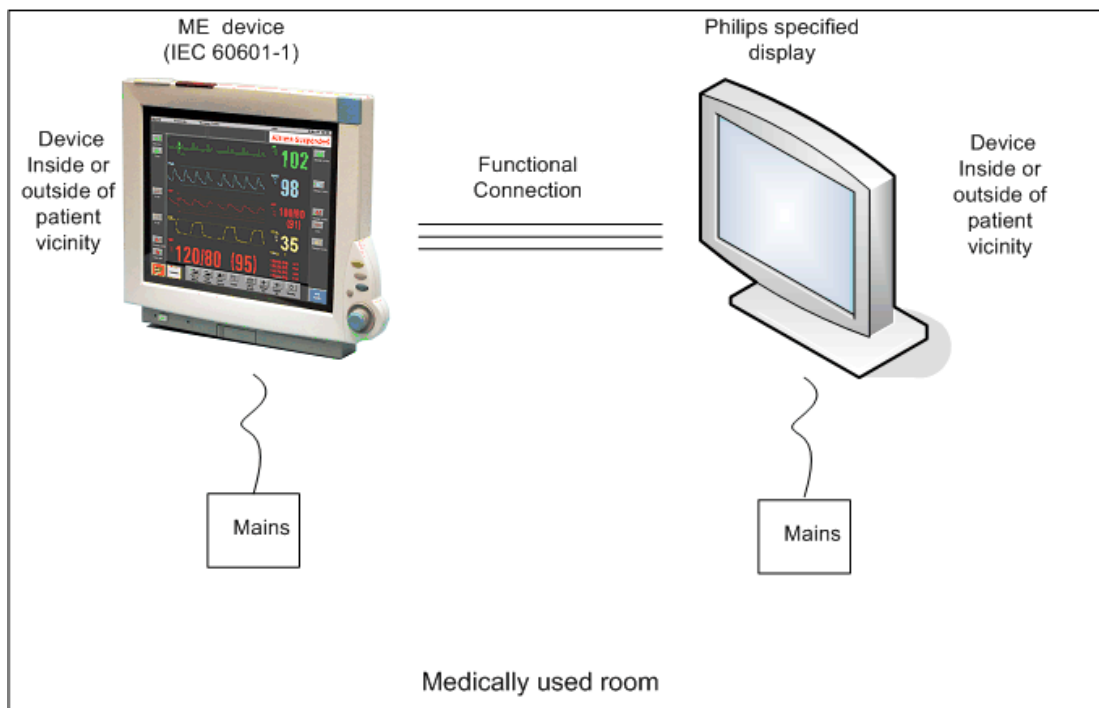
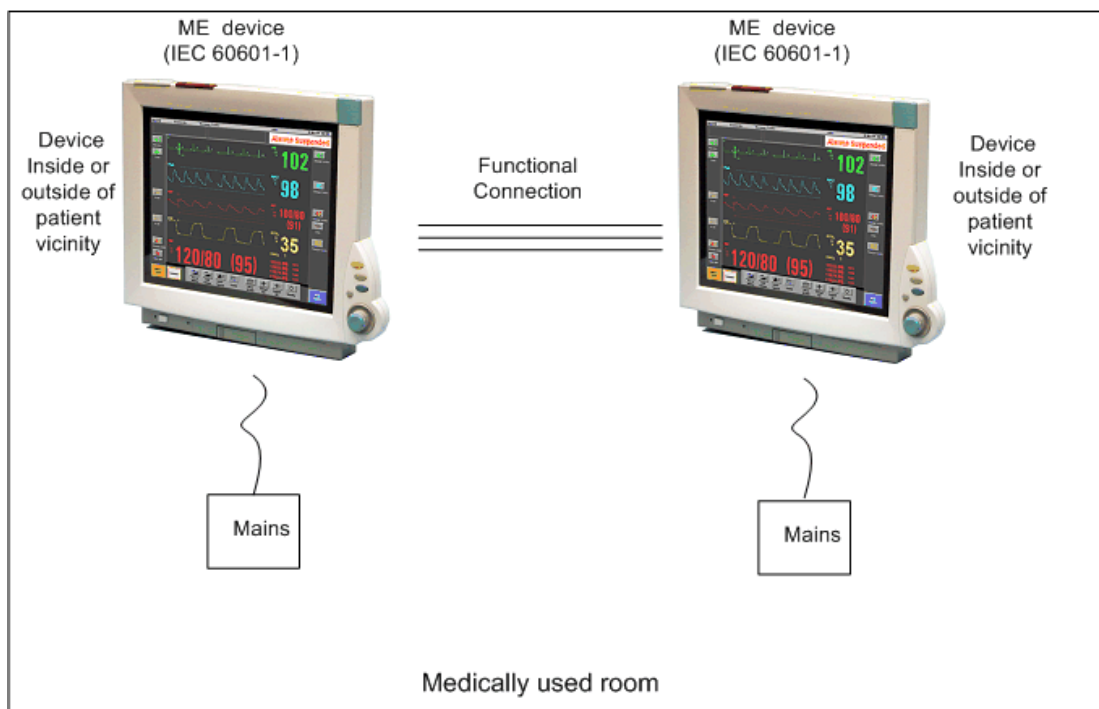
### Required Protective Measures at System Installation

For any IT equipment (IEC60950) operated in patient vicinity ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1. Use a separation device to ensure compliance. After installation of IT equipment in patient vicinity, an enclosure leakage current test is required.

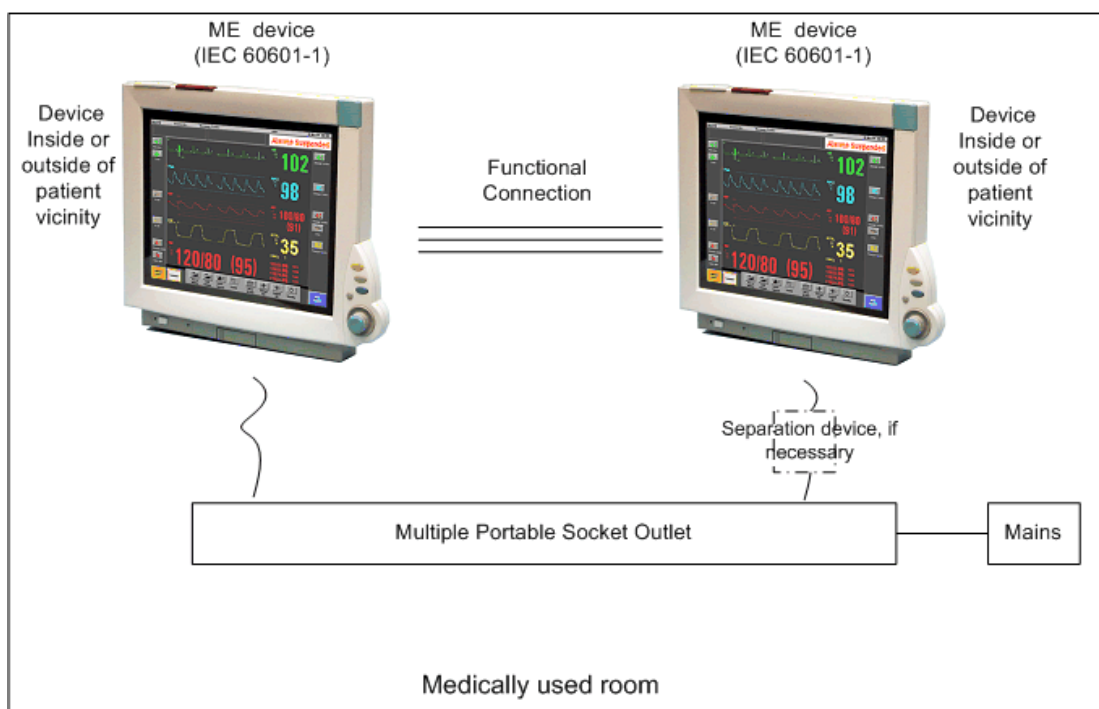


**Case 1: Medical Device Combined with Medical Device**

If you combine a medical device with another medical device (incl. Philips specified displays) to form a medical electrical system according to IEC60601-1-1, no additional protective measures are required. The medical electrical devices may be located in or outside the patient vicinity in a medically used room. This is valid as long as the medical devices are connected to separate mains outlets. No system test is required.



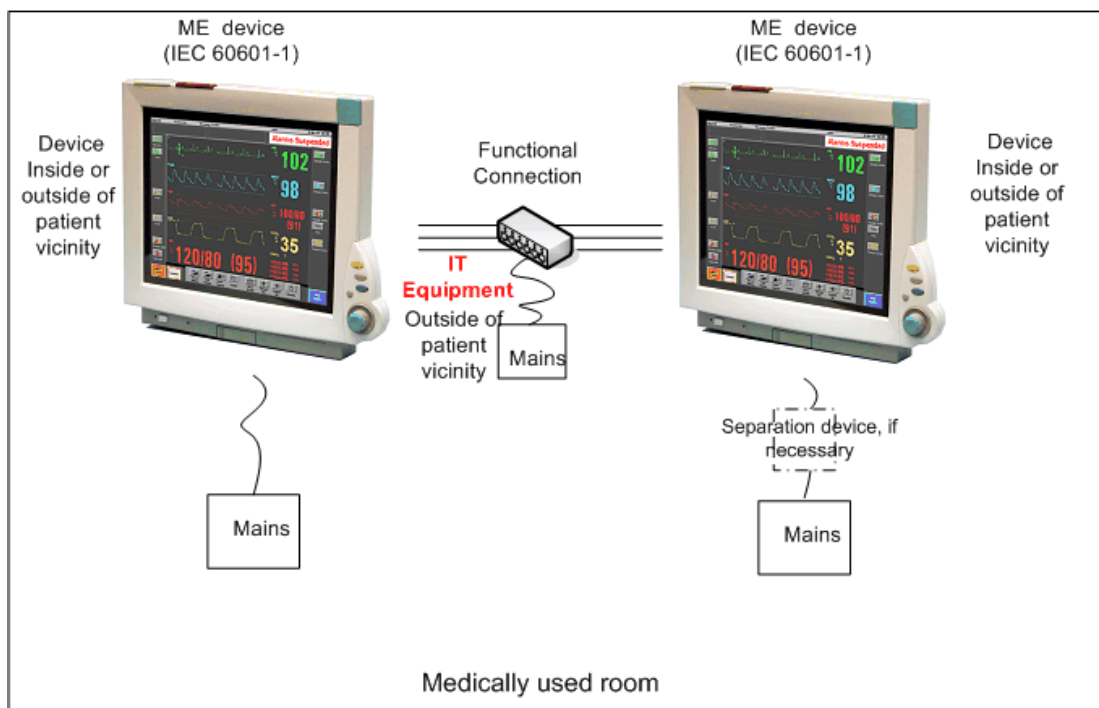
If the combined medical devices are connected to the same multiple portable socket outlet an enclosure leakage current test of the entire device combination on the multiple portable socket outlet is required to ensure that the resulting protective earth leakage current and equipment leakage current does not exceed the limits of IEC 60601-1-1. Avoid using multiple portable socket outlets. The medical electrical devices may be located in or outside the patient vicinity in a medically used room. If the limits are exceeded, additional protective measures are required, e.g. a separation device or the connection of each device to separate mains.



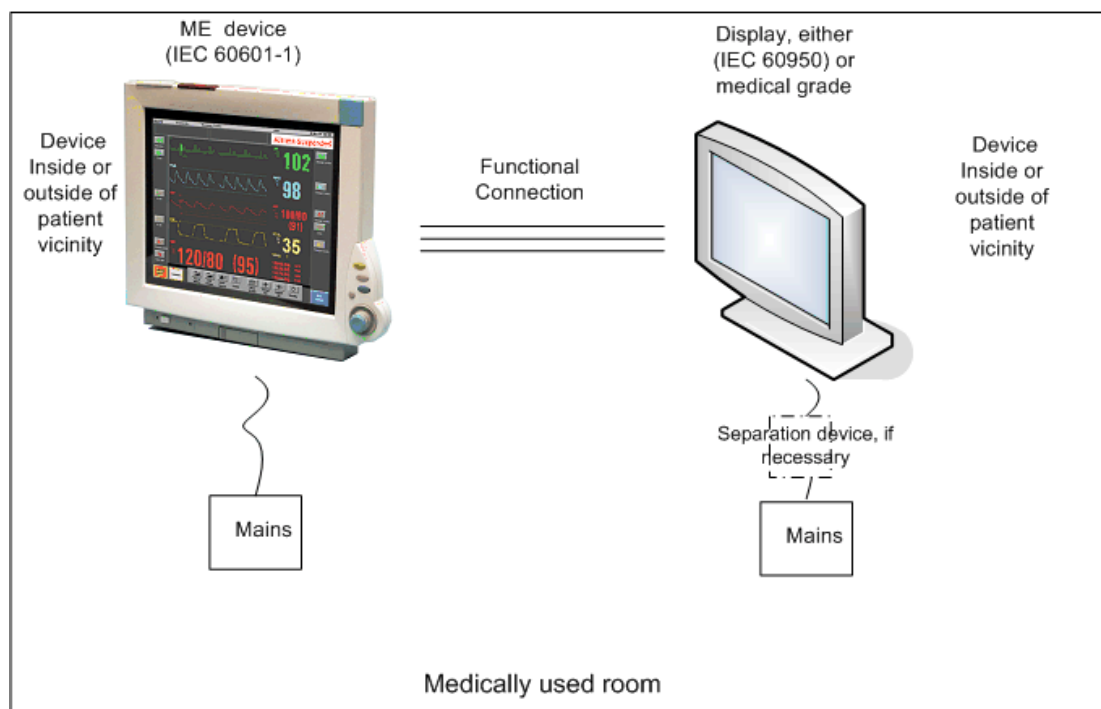
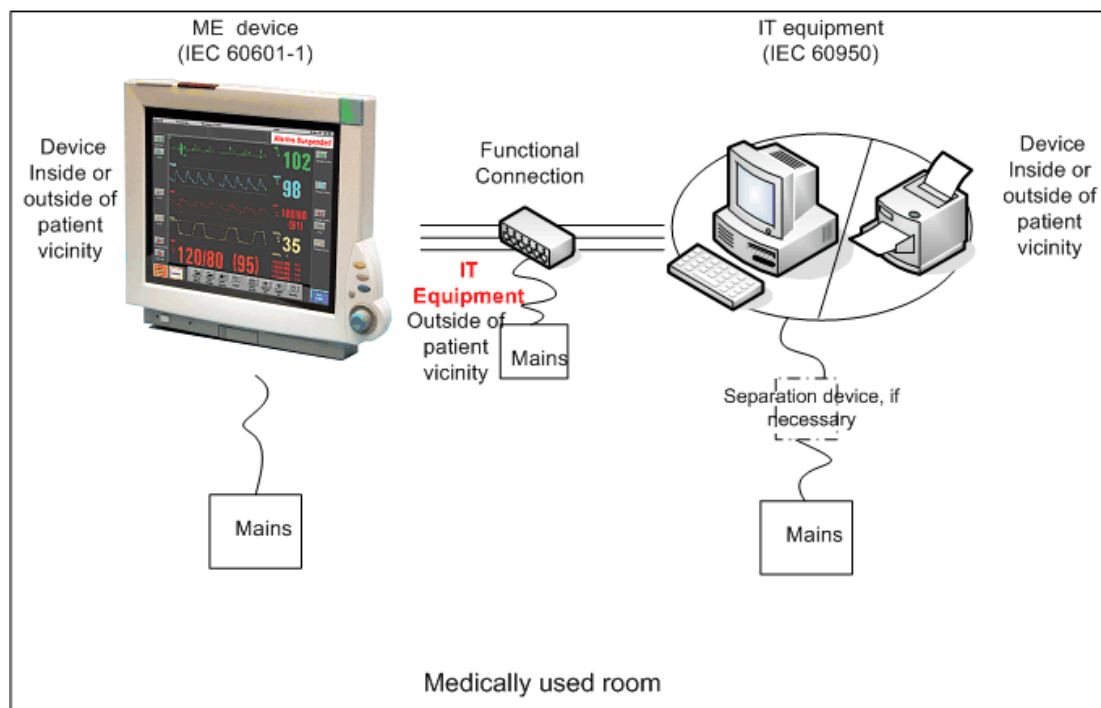


**Case 2: Medical Device Combined with a Non-Medical Device**

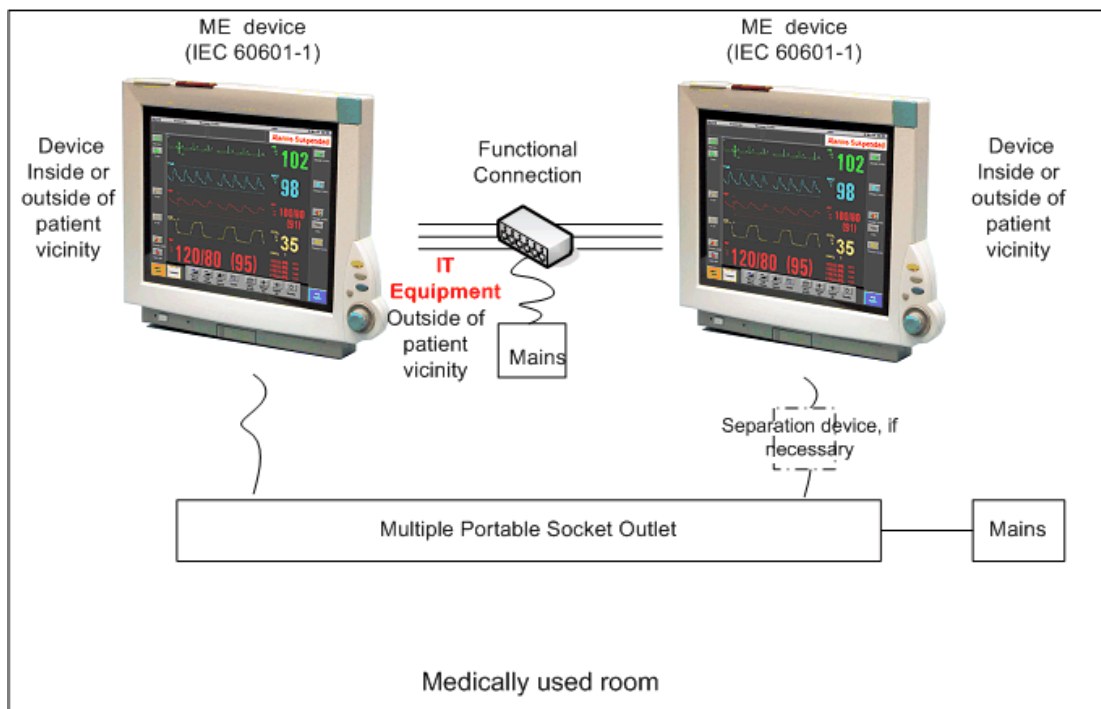
If you combine a medical device with a non-medical device to form a medical electrical system according to IEC60601-1-1, additional protective measures are required, e.g. usage of a separation device. The medical electrical devices or the IT equipment may be located in or outside the patient vicinity in a medically used room. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current and applied part leakage current does not exceed the limits of IEC 60601-1-1.



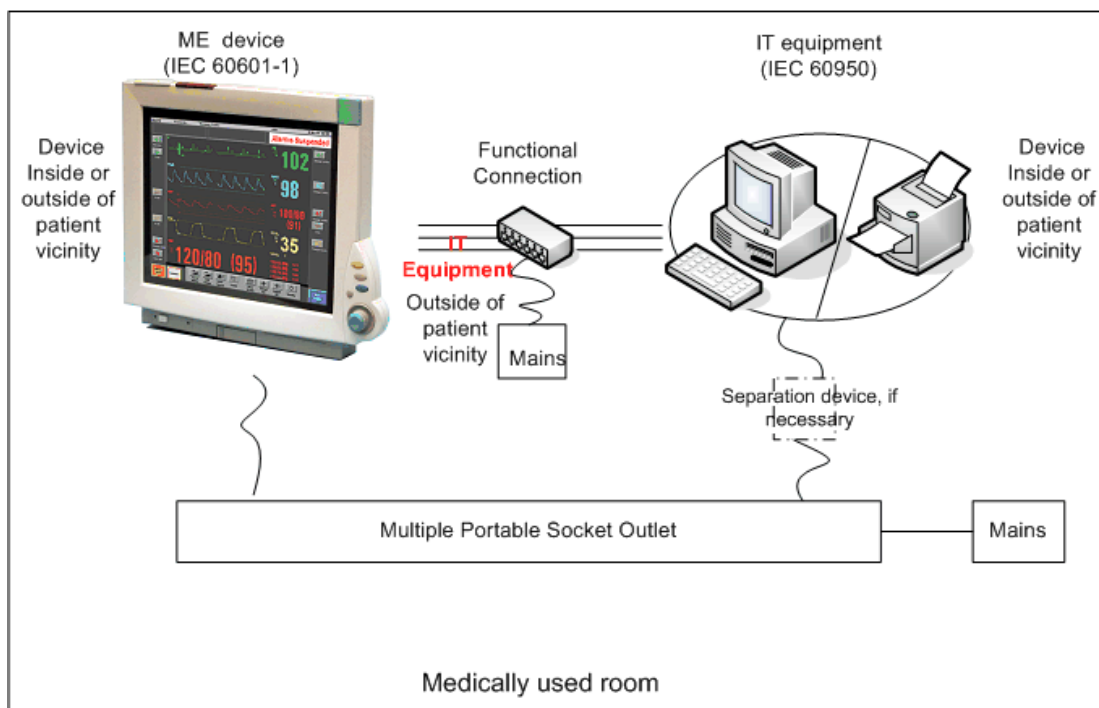
For any IT equipment (IEC60950) operated in patient vicinity ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1. Use a separation device to ensure compliance. After installation of IT equipment in patient vicinity, an enclosure leakage current test is required.



If the combined devices forming the medical electrical system are connected to the same multiple portable socket outlet, ensure that the resulting protective earth leakage current **and** equipment leakage current do not exceed the limits of IEC 60601-1-1. The medical electrical devices or IT equipment may be located in or outside the patient vicinity in a medically used room. Avoid using multiple portable socket outlets. If the limits of IEC 60601-1-1 are exceeded, additional protective measures are required, e.g. a separation device or the connection of each device to separate mains.

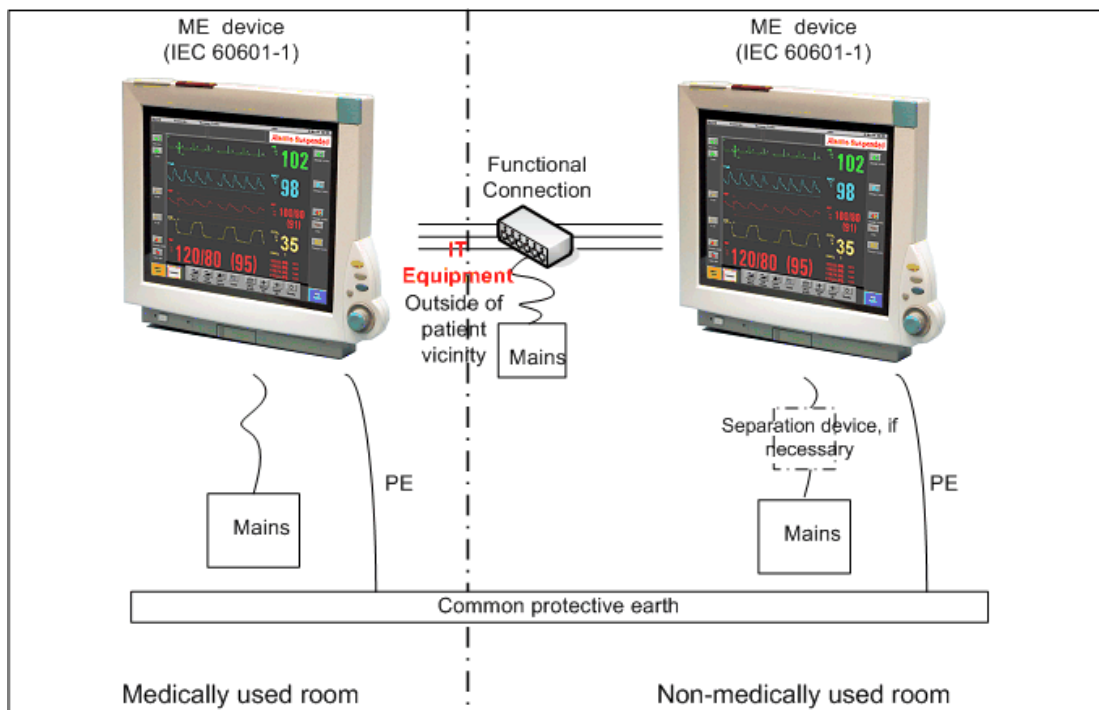


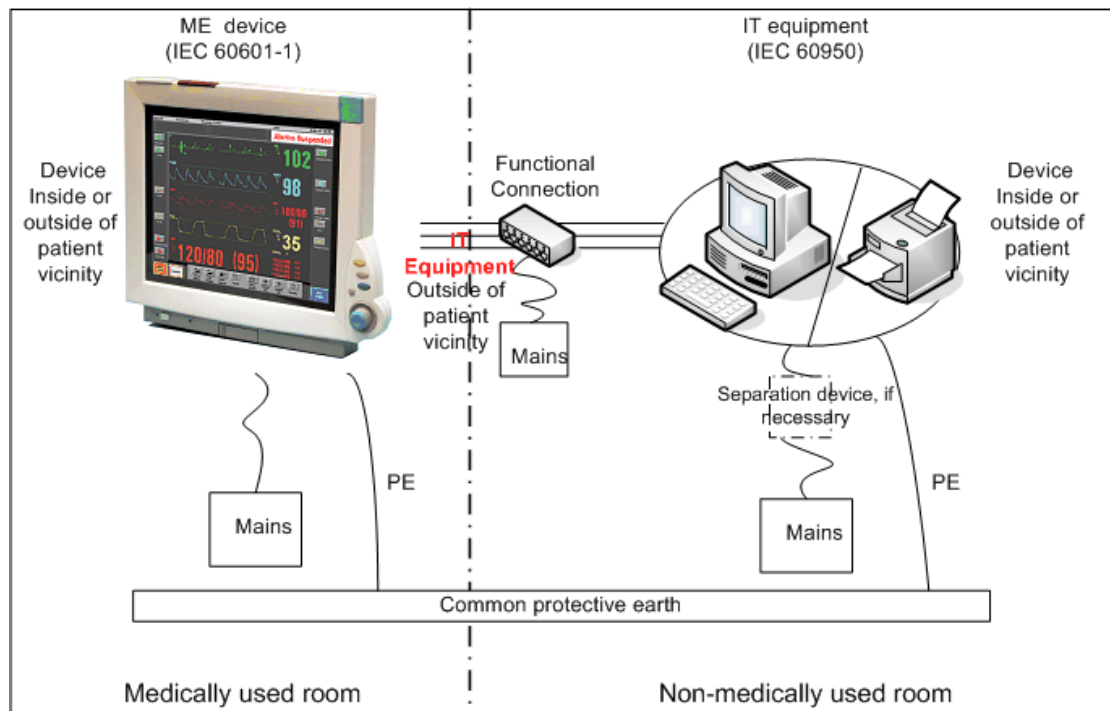
For any IT equipment (IEC60950) operated in patient vicinity ensure that the equipment leakage current does not exceed the limits described in IEC 60601-1. Use a separation device to ensure compliance. After installation of IT equipment in patient vicinity, an enclosure leakage current test is required.



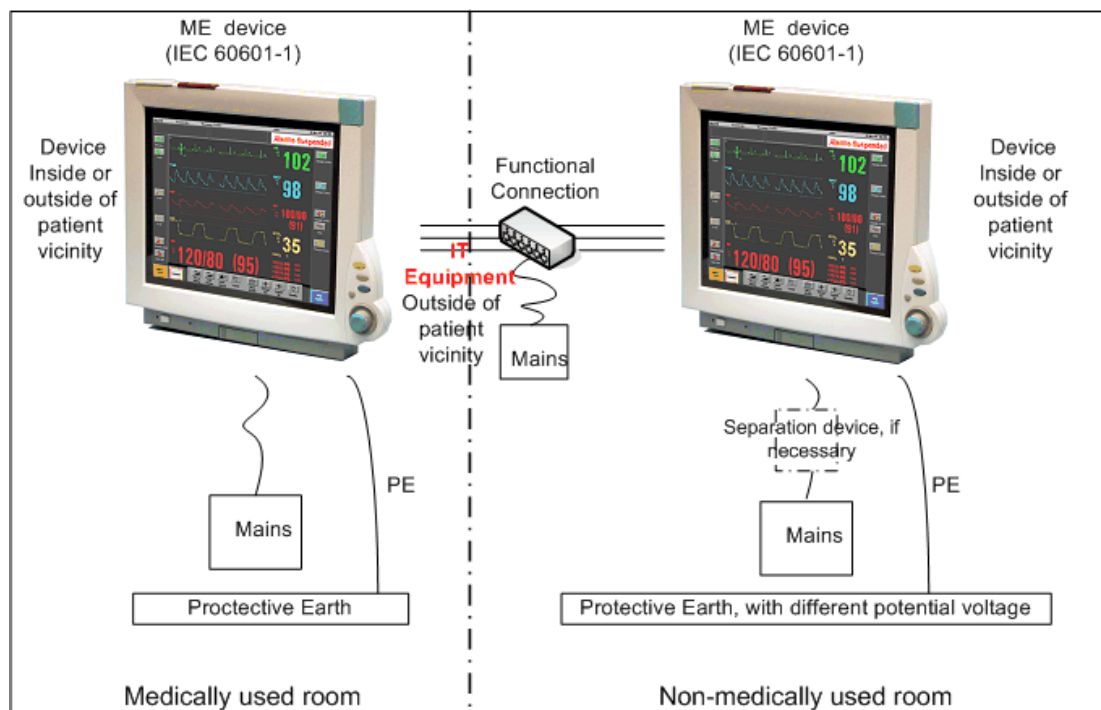
**Case 3: Medical Device Combined with a Medical or Non-Medical Device with one Device in a Non-Medically-Used Room**

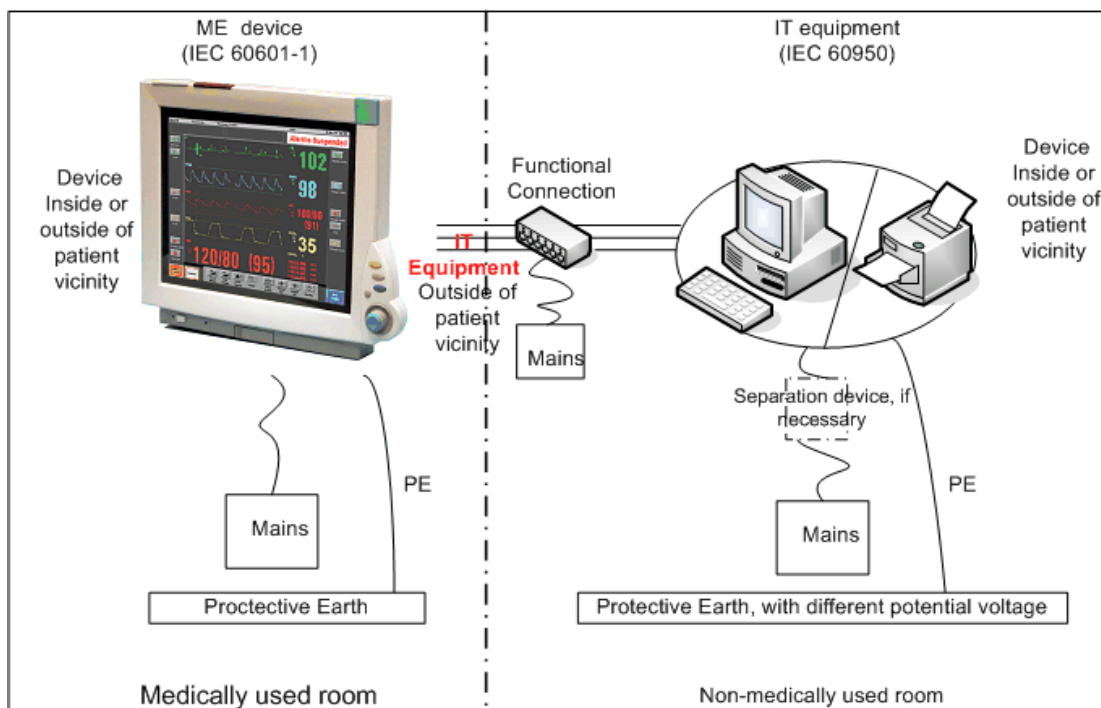
If you combine a medical device with a medical or non-medical device to form a medical electrical system according to IEC60601-1-1 using a common protective earth connection and one of the devices is located in a non-medically used room, additional protective measures are required, e.g. usage of a separation device or additional protective earth connection. The medical electrical devices or IT equipment may be located in or outside the patient vicinity. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current does not exceed the limits of IEC 60601-1-1.





If you combine a medical device with a medical or non-medical device to form a medical electrical system according to IEC60601-1-1 using two separate protective earth connections and one of the devices is located in a non-medically used room creating a potential voltage difference, additional protective measures are required, e.g. usage of a separation device or additional protective earth connection. The medical electrical devices or IT equipment may be located in or outside the patient vicinity. After system installation incl. protective measures, a system test is required to ensure that the resulting equipment leakage current does not exceed the limits of IEC 60601-1-1.





### System Test Procedure

If the medical electrical device has already been tested as a standalone device e.g. during factory safety testing, an equipment leakage current test must only be performed once the device is connected to the LAN network. If the medical electrical system has not been tested as a standalone device, the device has to be tested as a standalone device (without connection to the system) and as part of the system (with connection to the system).

Connect the detachable power cord of the device under test to the safety analyzer's test mains port. Connect the enclosure test lead of the safety analyzer to the enclosure of the device under test, e.g. to the equipotential connector. Refer to the documentation that accompanies the safety analyzer for further details on how to set up the test.

Test	Expected test results
Equipment Leakage Current Test (Normal Condition)	Sys1 $\leq 100\mu\text{A}$
Equipment Leakage Current Test (Single Fault Condition)	Sys2 $\leq 300\mu\text{A}$



After the testing of the device as a standalone device and as part of the system, check that the resulting values (without connection and with connection to the system) do not differ by more than +/- 10% from each other.

If the devices in the medical electrical system are connected to a multiple portable socket outlet the resulting protective earth leakage current needs to be determined. All system components must be connected to the multiple portable socket outlet and be switched on during this measurement.

Test	Expected test results
Protective Earth Leakage Current of Multiple Socket Outlets	Sys3 <= 300μA

Refer to the documentation that accompanies the safety analyzer for further details on how to set up the test.

## Preventive Maintenance Procedures

### Noninvasive Blood Pressure Measurement Calibration

Carry out the noninvasive blood pressure measurement performance tests at least every two years , or as specified by local laws (whichever comes first).

### Microstream CO2 Calibration

Perform the Microstream CO2 calibration once a year or after 4000 hours of continuous use (whichever comes first) and following any repairs or the replacement of any instrument parts. See *Microstream CO2 Performance Test* (on page 90) for details.

## Performance Assurance Tests

Some of the following test procedures must be performed in service mode. To enter service mode select **Operating Modes** in the main menu. Then select **Service Mode** and enter the password.

If required, open the screen menu in the monitor info line at the top of the screen and select **Service** to access the service screen. This is required particularly for Anesthetic Gas Module testing procedures.

## Basic Performance Assurance Test

This section describes the basic performance test procedure. Please refer to the section When to Perform Tests for detailed information on when which test procedure is required.

### Procedure:

Power on the monitoring system and go into demo mode. Check that each connected parameter (integrated, module, MMS, Gas Analyzer, Vuelink connected device) displays values.

## Full Performance Assurance Test

The following sections describe the full performance testing procedures i.e. detailed testing of each parameter with a patient simulator or specified tools. Please refer to the section When to perform Tests for information on when which testing procedure is required.

## ECG/Resp Performance Test

This test checks the performance of the ECG and respiration measurements.

**Tools required:** Patient simulator.

### ECG Performance

1. Connect the patient simulator to the ECG/Resp connector.
2. Configure the patient simulator as follows:
  - ECG sinus rhythm.
  - HR = 100 bpm or 120 bpm (depending on your patient simulator).
3. Check the displayed ECG wave and HR value against the simulator configuration.
4. The value should be 100bpm or 120 bpm $\pm$  2 bpm.

### Respiration Performance

1. Change the Patient Simulator configuration to:
  - Base impedance line 1500 Ohm.
  - Delta impedance 0.5 Ohm.
  - Respiration rate 40 rpm or 45 rpm.
2. The value should be 40 rpm  $\pm$  2 rpm or 45 rpm  $\pm$  2 rpm.

Test	Expected test results
ECG Performance Test	100bpm $\pm$ 2bpm or 120bpm $\pm$ 2bpm
Respiration Performance Test	40 rpm $\pm$ 2 rpm or 45 rpm $\pm$ 2 rpm

## ECG Sync Performance Test

This test checks the performance of ECG synchronization between the monitor and a defibrillator. It only needs to be performed when this feature is in use as a protocol at the customer site.

**Tools required:**

- Defibrillator with ECG Sync and Marker Output.
  - Patient simulator.
1. Connect the patient simulator to the ECG connector and the defibrillator to the ECG Sync Output on the monitor.
  2. Set the patient simulator to the following configuration:
    - HR = 100 bpm or 120 bpm (depending on your patient simulator).
    - ECG sinus rhythm.
  3. Switch the defibrillator to simulation mode.
  4. Check that the marker pulse is displayed before the T-wave begins.

Test	Expected test results
ECG Sync Performance Test	Marker pulse is displayed before the T-wave begins

## SpO2 Performance Test

This test checks the performance of the SpO2 measurement.

**Tools required:** none

1. Connect an adult SpO2 transducer to the SpO2 connector.
2. Measure the SpO<sub>2</sub> value on your finger (this assumes that you are healthy).
3. The value should be between 95% and 100%.

Test	Expected test results
SpO2 Performance Test	95% and 100%

### Measurement Validation

The SpO<sub>2</sub> accuracy has been validated in human studies against arterial blood sample reference measured with a CO-oximeter. In a controlled desaturation study, healthy adult volunteers with saturation levels between 70% and 100% SaO<sub>2</sub> were studied. The population characteristics for those studies were:

- about 50% female and 50% male subjects
- age range: 18 to 45
- skin tone: from light to black

#### NOTE

A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor. However, it can be used to demonstrate that a particular pulse oximeter monitor reproduces a calibration curve that has been independently demonstrated to fulfill a particular accuracy specification.

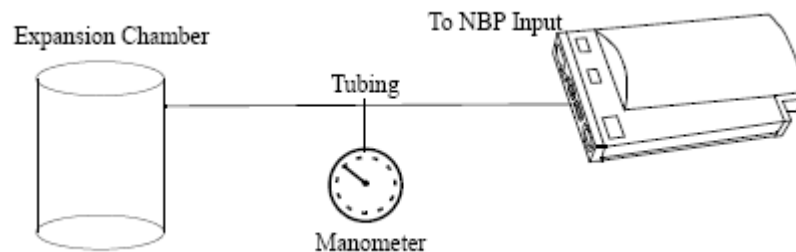
### NBP Performance Test

This section describes NBP test procedures. The monitor must be in service mode and the screen “Service A” must be selected to perform these tests. The NBP Performance Test consists of:

- NBP Accuracy Test
- NBP Leakage Test
- NBP Linearity Test
- Valve Test

### NBP Accuracy Test

This test checks the performance of the non-invasive blood pressure measurement. Connect the equipment as shown:



Tools required:

- Reference manometer (includes hand pump and valve), accuracy 0.2% of reading.
- Expansion chamber (volume 250 ml +/- 10%)
- Appropriate tubing.

In service mode, the systolic and diastolic readings indicate the noise of NBP channels 1 and 2 respectively. When static pressure is applied, the reading in NBP channel 1 should be below 50. The value in parentheses indicates the actual pressure applied to the system.

1. Connect the manometer and the pump with tubing to the NBP connector on the MMS and to the expansion chamber.
2. In service mode, select the **Setup NBP** menu.
3. Select **Close Valves: On**
4. Raise the pressure to 280 mmHg with the manometer pump.
5. Wait 10 seconds for the measurement to stabilize.
6. Compare the manometer values with the displayed values.
7. Document the value displayed by the monitor (**x1**).
8. If the difference between the manometer and displayed values is greater than 3 mmHg, calibrate the MMS. If not, proceed to the leakage test.
9. To calibrate the MMS, select **Close Valves off** then **Calibrate NBP** and wait for the instrument to pump up the expansion chamber. Wait a few seconds after pumping stops until **EnterPrVal** is highlighted and then move the cursor to the value shown on the manometer. If one of the following prompt messages appears during this step, check whether there is leakage in the setup:
  - NBP unable to calibrate—cannot adjust pressure
  - NBP unable to calibrate—unstable signal
10. Press **Confirm**.

If the INOP NBP Equipment Malfunction message occurs in monitoring mode, go back to service mode and repeat the calibration procedure.

### NBP Leakage Test

The NBP leakage test checks the integrity of the system and of the valve. It is required once every two years and when you repair the monitor or replace parts.

1. If you have calibrated, repeat steps 2 to 6 from the accuracy test procedure so that you have 280 mmHg pressure on the expansion chamber.
2. Watch the pressure value for 60 seconds.
3. Calculate and document the leakage test value (**x2**).  

$$x2 = P1 - P2$$
 where P1 is the pressure at the beginning of the leakage test and P2 is the pressure displayed after 60 seconds.  
 The leakage test value should be less than 6 mmHg.

**NBP Linearity Test**

1. Reduce the manometer pressure to 150 mmHg.
2. Wait 10 seconds for the measurement to stabilize.
3. After these 10 seconds, compare the manometer value with the displayed value.
4. Document the value displayed by the monitor (**x3**)
5. If the difference is greater than 3 mmHg, calibrate the MMS (see steps 9 to 10 in the accuracy test procedure).

**Valve Test**

1. Raise the pressure again to 280 mmHg.
2. Select **Close valves: Off**.
3. Wait five seconds and then document the value displayed. The value should be less than 10 mmHg.
4. Document the value displayed by the monitor (**x4**).

***Expected Test Results for NBP Accuracy Test, Leakage Test, Linearity Test & Valve Test***

<b>Test</b>	<b>Expected test results</b>
Accuracy test	x1 = value displayed by monitor Difference $\leq$ 3mmHg
Leakage test	x2 = leakage test value x2 < 6 mmHg
Linearity test	x3 = value displayed by monitor Difference $\leq$ 3mmHg
Valve Test	x4 = value < 10 mmHg

**Invasive Pressure Performance Test**

This test checks the performance of the invasive pressure measurement.

**Tools required:** Patient simulator.

1. Connect the patient simulator to the pressure connector.
2. Set the patient simulator to 0 pressure.
3. Make a zero calibration.
4. Configure the patient simulator as P(static) = 200 mmHg.
5. Wait for the display.

- The value should be  $200 \text{ mmHg} \pm 5 \text{ mmHg}$ . If the value is outside these tolerances, calibrate the Invasive Pressure measurement. If the measurement was calibrated with a dedicated reusable catheter, check the calibration together with this catheter.

**Table 4:**

Test	Expected test results
Invasive Pressure Performance Test	$200 \text{ mmHg} \pm 5 \text{ mmHg}$

## Temperature Performance Test

This test checks the performance of the temperature measurement.

Tools required: Patient simulator (with  $0.1^\circ\text{C}$  or  $0.2^\circ\text{F}$ ).

- Connect the patient simulator to the temperature connector.
- Configure the patient simulator to  $40^\circ\text{C}$  or  $100^\circ\text{F}$ .
- The value should be  $40^\circ\text{C} \pm 0.2^\circ\text{C}$  or  $100^\circ\text{F} \pm 0.4^\circ\text{F}$ .

**Table 2:**

Test	Expected test results
Temperature Performance Test	$40^\circ\text{C} \pm 0.2^\circ\text{C}$ or $100^\circ\text{F} \pm 0.4^\circ\text{F}$

## M3014A Capnography Extension Performance Tests

The procedures below describe the mainstream and sidestream CO<sub>2</sub> performance tests for the M3014A Capnography Extension.

### Mainstream CO<sub>2</sub> Accuracy Check

Tools Required:

- three airway adapters
- Verification Gas M2506A
- Gas cylinder regulator M2505A

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

#### Procedure:

- Attach the M2501A CO<sub>2</sub> sensor to the patient monitor. Attach an airway adapter to the sensor. Make sure that the sensor is disconnected from the patient circuit.
- Switch on the patient monitor.
- Enter the monitor's Service Mode.

4. Using the sensor status provided in the M2501A Serial protocol, wait for the M2501A sensor to warm up to its operating temperature.
5. The default setting for gas temperature is 22°C. If the gas temperature is significantly above or below this value, correct the gas temperature setting.
6. Zero the sensor on the airway adapter being used in this test. Ensure Zero Gas is set to Room Air
7. Attach a regulated flowing gas mixture of 5% CO<sub>2</sub>, balance N<sub>2</sub> to the airway adapter.
8. Set the gas correction to off.
9. Allow a few seconds for the gas mixture to stabilize and observe the CO<sub>2</sub> value. The expected value is 5% of the ambient pressure  $\pm 2$ mmHg

**NOTE**

Make sure that you follow the above steps correctly. If the sensor fails this check it must be exchanged. The sensor cannot be calibrated.

**Example for an expected test result:**

The expected test result for an altitude of 0 m (sea level) at approximately 760 mmHg ambient pressure is:

**Table 6:**

Test	Expected test results (x1)	Acceptance Range
Mainstream CO <sub>2</sub> Accuracy Test	5% of 760 mmHg pressure $\pm 2$ mmHg	36 mmHg - 40 mmHg

**NOTE**

The expected test results will differ depending on the conditions (i.e. altitude or ambient pressure).

**Sidestream CO<sub>2</sub> Accuracy Check**

Tools Required:

- Cal gas flow regulator M2267A
- Cal tube 13907A
- Verification Gas M2506A
- Straight Sample Line M2776A

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

**Procedure:**

1. Attach the M2741A CO<sub>2</sub> sensor to the patient monitor. Attach the sample line and the cal tube to the sensor. Make sure that the sensor is disconnected from the patient circuit.
2. Switch on the patient monitor.
3. Enter the monitor's Service Mode.



4. Using the sensor status provided in the M2741A Serial protocol, wait for the M2741A sensor to warm up to its operating temperature.
5. Zero the sensor. Ensure Zero Gas is set to Room Air
6. Attach a regulated flowing gas mixture of 5% CO<sub>2</sub>, balance N<sub>2</sub> to the cal tube.
7. Set the gas correction to off.
8. Allow a few seconds for the gas mixture to stabilize and observe the CO<sub>2</sub> value. The expected value is 5% of the ambient pressure  $\pm 2$  mmHg

**NOTE**

Make sure that you follow the above steps correctly. If the sensor fails this check it must be exchanged. The sensor cannot be calibrated

**Example for an expected test result:**

The expected test result for an altitude of 0 m (sea level) at approximately 760 mmHg ambient pressure is:

Test	Expected test results (x2)	Acceptance Range
Sidestream CO <sub>2</sub> Accuracy Test	5% of 760 mmHg pressure $\pm 2$ mmHg	36 mmHg - 40 mmHg

**NOTE**

The expected test results will differ depending on the conditions (i.e. altitude or ambient pressure).

**Sidestream CO<sub>2</sub> Flow Check**

Check the flow rate in the Sidestream CO<sub>2</sub> extension as follows:

1. Connect the flowmeter to the sample line
2. Check on the flowmeter the flow that the Sidestream CO<sub>2</sub> extension pump draws. It should be 50 ml/min  $\pm$  10 ml/min. If the value is not within tolerance check your setup again and perform another flow check. If it fails again, the sensor must be replaced. The sensor cannot be calibrated.

## Microstream CO2 Performance Test

Allow five seconds between individual service procedures to ensure stable equipment conditions. When certain monitor procedures are running, service procedures are not possible and trying to start them will result in a message **Service Operation Failed** in the monitor's status line. Wait until the monitor completes the current operation, then restart the service procedure.

This test checks the performance of the Microstream CO2 measurement. The Microstream CO2 measurement can either be integrated into the IntelliVue MP5 monitor or, for other IntelliVue monitors, into the M3015A MMS Extension. The Microstream CO2 performance test is required once per year and when the instrument is repaired or when parts are replaced.

This test uses calibration equipment that you can order (see the *Parts* section for the part number). The procedure is summarized in the following steps. Refer to the documentation accompanying the equipment for detailed instructions.

Tools Required:

- Standard tools, such as screwdriver, tweezers
- Electronic flowmeter, M1026-60144
- Gas calibration equipment:
  - Cal 1 gas 15210-64010 (5% CO<sub>2</sub>)
  - Cal 2 gas 15210-64020 (10% CO<sub>2</sub>)
  - Cal gas flow regulator M2267A
  - Cal tube 13907A
- Calibration Line M3015-47301

You also need a local barometric pressure rating received from a reliable local source (airport, regional weather station or hospital weather station) which is located at the same altitude as the hospital.

The CO2 calibration for the Microstream extension consists of the following steps:

- Leakage check
- Barometric pressure check and calibration, if required.
- Pump check
- Flow check and calibration, if required
- Noise check
- CO2 Cal check and calibration, if required
- CO2 Cal verification using 2nd cal gas

Perform all checks in the same session.

## Leakage Check

The leakage check consists of checking the tubing between:

- the pump outlet and the mCO<sub>2</sub> outlet and
- the pump inlet and FilterLine inlet.

Check the user's guide of the flowmeter for details on how to make a correct flow reading.

### Part 1

1. Go into service mode and select **Setup CO2** menu.
2. Connect a FilterLine to the Microstream CO<sub>2</sub> input to start the pump running.
3. Check the ambient pressure and the cell pressure shown in the monitor's status line. The cell pressure should be approximately 20 mmHg lower than ambient pressure.
4. Connect the flowmeter outlet to the FilterLine inlet using a flexible connecting tube.
5. Block the mCO<sub>2</sub> outlet using your fingertip and observe the flowmeter display. The value on the flowmeter (**x1**) should decrease to between 0 and 4 ml/min, accompanied by an audible increase in pump noise. If the value is within the tolerance limits, continue with part 2 of the leakage check.
6. If the value is outside the tolerance limits, there is a leakage between the pump outlet and the mCO<sub>2</sub> outlet.
7. Open the MMS Extension or MP5 and check the tubing connections at the pump outlet and the extension gas outlet. If the connections are good, then there is a leakage in the tubing and you must exchange the MMS Extension or the mCO<sub>2</sub> Assembly of the MP5 respectively.

### Part 2

1. Disconnect the flowmeter from the Part 1 setup and connect the flowmeter inlet to the M3015A gas outlet or the MP5 mCO<sub>2</sub> gas outlet.
2. Leave the Filterline connected to the M3015A inlet or the MP5 mCO<sub>2</sub> inlet..
3. Block the inlet of the FilterLine using your fingertip and observe the flowmeter display. The value on the flowmeter (**x2**) should decrease to between 0 and 4 ml/min, accompanied by an audible increase in pump noise. The cell pressure shown in the status line on the display should decrease to between 300 and 500 mmHg. Do not block the inlet for longer than 25 seconds as this will lead to an "Occlusion" INOP. If the value is within the tolerance limits, there are no leakages and the leakage check is completed; proceed to the pump check.
4. If the value is not within the tolerance limits, there is a leakage between the FilterLine inlet and the pump inlet.
5. Check the FilterLine connections and open the M3015A or MP5 to check the tubing connections at the pump inlet and the M3015A or MP5 mCO<sub>2</sub> gas inlet. If the connections are good, try replacing the FilterLine and repeating the leakage check. If the situation remains, there is a leakage in the tubing and the M3015A or the mCO<sub>2</sub> assembly of the MP5 must be exchanged.

### Barometric Pressure Check and Calibration

Check the barometric pressure value in the M3015A MMS Extension or the MP5 as follows:

1. Go into service mode and select **Setup CO<sub>2</sub>** menu.
2. Connect a FilterLine to the Microstream CO<sub>2</sub> input. This activates the pump in the M3015A MMS Extension or the MP5.
3. The status line at the bottom of the screen displays “CO<sub>2</sub> pressure reading (ambient/cell) xxx/yyy” where xxx is the ambient pressure and yyy is the measured cell pressure. Check whether the ambient pressure value (**x3**) matches (within the acceptable tolerance of  $\pm 12$  mm Hg) the reference value you have received. If so, proceed to the leakage check. If the value is not correct, calibrate as follows.
  - a. Select **CO<sub>2</sub>** then select **Barom. Press** to activate a table of values.
  - b. Select the value in the table which matches the reference value received from a reliable local source (airport, regional weather station or hospital weather station). (The values are displayed with a resolution of 2 mmHg up to 500 mmHg and a resolution of 1 mmHg from 500 mmHg to 825 mmHg.) Note: the selected value must be within  $\pm 10\%$  of the current measured ambient pressure, otherwise an error message will occur at restarting the monitor.
  - c. Confirm the barometric pressure setting.
  - d. Check that the ambient pressure displayed in the status line at the bottom of the screen is the same as the value which you selected from the list in step b.

### Pump Check

1. Connect the flowmeter inlet to the mCO<sub>2</sub> gas outlet.
2. Connect the FilterLine to the mCO<sub>2</sub> inlet.
3. Block the inlet of the FilterLine using your fingertip and observe the cell pressure on the monitor display. The cell pressure (**x4**) should be more than 120 mmHg below the ambient pressure shown. If the pressure difference is less than 120 mmHg, the pump is not strong enough and you should replace it, irrespective of the Pump OpTime.

### Flow Rate Check and Calibration

Check the flow rate in the M3015A MMS Extension or the MP5 as follows:

1. Connect the flowmeter to the CO<sub>2</sub> FilterLine.
2. Check on the flowmeter the flow that the M3015A MMS Extension or MP5 mCO<sub>2</sub> pump draws (**x5**). It should be 50 ml/min  $\pm$  7.5 ml/min. If the value is within tolerance, proceed to the CO<sub>2</sub> Gas calibration check. If the value is not within tolerance, calibrate as follows.
3. Adjust the flow in the instrument by selecting **Increase Flow** or **Decrease Flow** until it is as close as possible to 50 ml per minute as indicated on the flowmeter gauge.
4. When you are satisfied that the flow is set as close as possible to 50 ml per minute, select **Store Flow** and confirm the setting. If you do not store the adjusted flow within 60 seconds of the adjustment, the old flow setting is restored.

5. If you cannot adjust the flow to within tolerance, replace the pump . If you still cannot make the flow adjustment, this indicates a fault in the measurement extension, which must be replaced.

Note that the pump can only be replaced on M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx)

### Noise Check

1. With the monitor in service mode, select **Setup CO<sub>2</sub>** menu.
2. Disconnect the flowmeter and connect the 5% calibration gas and flow regulator in its place.
3. Open the valve to apply the 5% calibration gas and wait until the value is stable.
4. Check the noise index (**x6**) displayed next to the CO<sub>2</sub> value on the display (this indicates the level of noise on the CO<sub>2</sub> wave). If the value exceeds 3 mmHg, replace the measurement extension.

### CO<sub>2</sub> Gas Measurement Calibration Check

After switching the measurement extension on, wait at least 20 minutes before checking the calibration. Check the calibration of the CO<sub>2</sub> gas measurement as follows:

1. Check that the 5% calibration gas and flow regulator are connected.
2. Calculate the expected measurement value in mmHg as follows:  
 $0.05 \times (\text{ambient pressure}) = \text{value mmHg}$   
 for example  $0.05 \times 736 = 36.8 \text{ mmHg}$  (with an ambient pressure of 736 mmHg)
3. Open the valve on the flow regulator to allow 5% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
4. Check that the value on the instrument (measurement value on the main screen, **x7**) matches the calculated mmHg value  $\pm 2.6 \text{ mmHg}$ . If the value is outside the tolerance, calibrate as described in step 1 in this procedure onwards.
5. Disconnect the 5% calibration gas and connect the 10% calibration gas.
6. Calculate the expected measurement value and tolerance in mmHg as follows:  
 $0.1 \times (\text{ambient pressure}) = \text{value mmHg}$   
 $\pm 0.07 \times (\text{value mmHg}) = \text{tolerance}$   
 for example  $0.1 \times 737 \text{ mmHg} = 73.7 \text{ mmHg}$  (with an ambient pressure of 737 mmHg)  
 $\pm 0.07 \times 73.7 \text{ mmHg} = \pm 5.16 \text{ mmHg tolerance}$
7. Open the valve on the flow regulator to allow 10% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
8. Check that the value on the instrument (**x8**) matches the calculated mmHg value within the calculated tolerance. If so, the measurement extension is correctly calibrated. If the value is outside the tolerance, calibrate as follows.
9. If not already connected, connect the 5% calibration gas.
10. Select **Cal. CO<sub>2</sub>**.
11. Select the value for the calibration gas. (The default value is 5.0%.)

12. Open the valve on the calibration gas to allow CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize before the start of the calibration. Leave the valve open until the instrument gives a prompt that gas can be removed.
13. The extension calibrates and prompts when calibration is successful.

### Calibration Verification

1. Reopen the 5% gas valve and allow the value to stabilize.
2. Check that the value displayed on the monitor is correct within the tolerance (see step above).
3. Disconnect the 5% calibration gas and connect the 10% calibration gas.
4. Open the valve on the flow regulator to allow 10% CO<sub>2</sub> gas to flow into the extension. Allow the value to stabilize.
5. Check that the value displayed on the monitor is correct within the tolerance (see step above).

If one or both values are not within tolerances, you must exchange the M3015A MMS Extension or the MP5 mCO<sub>2</sub> Assembly.

Test	Expected Test Results
Leakage Check parts 1 and 2	<b>x1</b> = value of part 1 leakage check on flowmeter ( <b>x1</b> < 4.0 ml/min) <b>x2</b> = value of part 2 leakage check on flowmeter ( <b>x2</b> < 4.0 ml/min)
Barometric Pressure Check	<b>x3</b> = difference between the reference pressure and the measured ambient pressure displayed on the monitor ( <b>x3</b> < 12 mmHg)
Pump Check	<b>x4</b> = difference in pressure between cell pressure and ambient pressure displayed on the monitor during occlusion ( <b>x4</b> > 120 mmHg)
Flow Check	<b>x5</b> = difference between measured value and 50.0 ml/min ( <b>x5</b> < 7.5 ml/min)
Noise Check	<b>x6</b> = noise index displayed on monitor ( <b>x6</b> < 3.0)
CO <sub>2</sub> Gas Calibration Check	<b>x7</b> = difference between measured CO <sub>2</sub> value and calculated value, based on 5% CO <sub>2</sub> cal. gas. ( <b>x7</b> < 2.6 mmHg)
CO <sub>2</sub> Cal Verification	<b>x8</b> = difference between measured CO <sub>2</sub> value and calculated value, based on 10% CO <sub>2</sub> cal. gas. ( <b>x8</b> < ± {0.07 x value calculated})

## Reset Time Counters

### NOTE

This procedure only applies to M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx).

You must check the time counters on the Microstream CO<sub>2</sub> extension before calibrating the instrument. As well, when parts are replaced, the appropriate counters must be reset to zero.

The counters for CO<sub>2</sub> pump, IR Src and Last Cal are displayed in the status line. The values are updated when entering the **Setup CO2** menu.

Observe the following guidelines:

- When calibrating the CO<sub>2</sub> extension, if no parts have been replaced, check the displayed values of **Reset PumpOpTime** and **Reset IRSourceTime** selections to make sure that they are within suggested guidelines for use (15,000 hours of continuous use). If the counter time is greater than 15,000 hours, replace the appropriate part. See *Repair and Disassembly* for details.
- When calibrating the CO<sub>2</sub> extension, if parts have been replaced, reset the appropriate values using the **Reset PumpOpTime** and **Reset IRSourceTime** selections. See *Repair and Disassembly* for details.

Resetting the PumpOpTime generates the INOP: "CO<sub>2</sub> OCCLUSION". To clear this INOP you must perform a flow check and store the flow in service mode (select **Store Flow**).

## CO2 Pump / CO2 Scrubber Replacement

### NOTE

This procedure only applies to M3015A with the old hardware Rev. A (i.e. Serial No. DE020xxxxx).

Refer to the Repair and Disassembly section for the replacement procedures.

## BIS Performance Test

These tests check the performance of the BIS measurement.

### PowerLink Test

1. In monitoring mode connect the BIS sensor simulator (P/N: M1034-61650, 453563233731) (for maximum usage please refer to the documentation delivered with the sensor simulator) to the patient interface cable.
2. Enter the BIS menu and select **Show Sensor**.
3. Start impedance check by pressing **StartCyclicCheck**. Check the displayed results. Expected results are:

Test	Expected test results
BIS Performance Test	Electrode 1 (+): 4-6 k $\Omega$ Electrode 2 (Ref): 8-17 k $\Omega$ Electrode 3 (1-): 2-4 k $\Omega$ Electrode 4 (2-): 3-5 k $\Omega$

### Nurse Call Relay Performance Test

The nurse call relay performance test can be performed either at the phone jack type connector (this only tests one relay) or at the multi-port nurse call connector (to test all three relays).

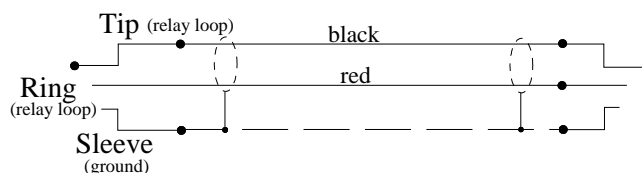
#### Phone Jack Type Connector Test (Traditional Nurse Call)

This test checks the operation of the traditional Nurse Call Relay. The Nurse Call Relay test is recommended for customer sites where the nurse call is in use. The Nurse Call relay functions as follows:

- Standard Operation—Relay open.
- Alarm Condition—Relay closed.

**Tools required:** Ohmmeter.

1. Plug a phono connector into the Nurse Call Relay connector.
2. Connect the ohmmeter.
3. If no alarm occurs, the relay contacts are open. When an alarm occurs, the relay contacts close.



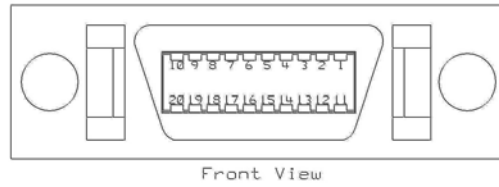
4. The expected test result is: Alarm condition - Relay closed.

Test	Expected test results
Nurse Call Relay Performance Test	Alarm Condition—Relay closed



### Multi-Port Nurse Call Connector Test (Flexible Nurse Call)

This test checks the operation of the Flexible Nurse Call Relay. The Nurse Call Relay test is recommended for customer sites where the nurse call is in use. The following diagram and table show the pins and relay identifiers of the connector:



Pin	Cable Color Coding	Relay
1	black	R2-closure
2	brown	R2-middle
3	red	R2-opener
4	orange	R3-closure
5	yellow	R3-middle
6	green	R3-opener
7	blue	n/a
8	purple	n/a
9	gray	n/a
10	white	n/a
11	pink	R1-closure
12	light green	R1-middle
13	black/white	R1-opener
14	brown/white	n/a
15	red/white	n/a
16	orange/white	n/a
17	blue/white	R_failure_closure
18	purple/white	R_failure_middle
19	green/white	R_failure_opener
20	red/black	n/a

The Nurse Call relay functions as follows:

- During standard operation R1,R2,R3 \_opener are closed; R1,R2,R3\_closure are open.
- During alarm condition—R1,R2,R3\_opener are open; R1,R2,R3\_closure are closed.

**Tools required:** Ohmmeter.

1. Plug an M8087-61001 cable into the Nurse Call Relay connector.
2. Connect the ohmmeter and measure the pins as indicated in the diagram and table.
3. The relay contacts should behave as described above. The behavior may vary depending on configuration choices. See the Configuration Guide for details on Alarm Relay settings.
4. The expected test results depend on the relay contact used. Please check that the correct relay activity is initiated during alarm condition.

### Power Loss Alarm Buzzer Performance Test (only if Multi-Port Nurse Call Connector Board is installed)

1. Switch on the monitor.
2. Remove the battery and disconnect the monitor from AC power.
3. The Power Loss Alarm Buzzer should beep for about one minute.
4. To switch off the alarm sound, either press the power button, connect the monitor to AC power or insert a battery

Test	Expected test results
Power Loss Alarm Buzzer Performance Test	Beep for one minute

### Docking Station Performance Test

1. Place the monitor on the docking station and close the lever.
2. Check that the green power LED lights up when the docking station is connected to AC Power.
3. Check that the monitor's AC Power LED lights up to indicate it is receiving power through the docking station. (PO:P)

### IIT Communication Test

1. Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
2. Go into Configuration mode and, in the **Network** menu, set the **RF Access Code** in each profile to match your installation.
3. Go into Service Mode. Select **Main Setup -> Instr. Telemetry** to access the Instrument Telemetry Service window.

4. Proper installation of the IIT module is assured by connecting to an access point over the wireless link. Place the monitor with the IIT module installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the **Conn. Status** field in the Instrument Telemetry Service window shows *Active*. *Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:*
  - Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value should be around  $-50 \pm 10$  in a 5 m distance from the access point used and the IIT link should be active, i.e. the **Conn. Status** field should be *Active* and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at both the monitor and the access point (both should be vertical).
  - Remove the antenna. The **RSSI** value should be around  $-90 \pm 10$ . The IIT link may be active but the connection could be unreliable. The **Conn. Status** field may toggle between *Inactive* and *Seeking*. If the difference between the **RSSI** values measured with and without antenna is significantly lower, check the antenna and the antenna connector for damage and verify that the cable from the IIT adapter to the antenna connector plate is connected properly.
5. If this test fails, retry in a different physical area with a different access point.

**Error Conditions:**

- The field **MAC Instr. Tele** should show a value **unequal to** 0000 0000 0000. If it does not, there is a communication problem between the monitor and the IIT adapter.
  - With an incorrect RF Access Code or an incorrect or defective antenna installation, the fields **IP Address**, **Server IP**, **Subnet Mask**, and **RSSI** in the Instrument Telemetry Service window will stay blank. The field **Conn. Status** will slowly toggle between *Inactive* and *Seeking*.
6. Perform the Access Point Controller (APC) test blocks as described in the Philips -USR\_ProductName- Wireless Network Installation and Configuration Guide.

## IntelliVue 802.11 Bedside Adapter Communication Test

1. Make sure the LAN cable is disconnected from the rear of the monitor, then switch on the monitor.
2. Go into Service Mode and select **Main Setup** -> **Network** -> **Setup WLAN**. In the **Setup WLAN** menu:
  - set **Mode** to either **802.11Ah**, **802.11G**, **802.11Bg** (not recommended), **Auto** (not recommended) or **None** (this setting disables the wireless LAN functionality permanently), to match your wireless infrastructure installation.
  - set **SSID** to match your installation.
  - set the **Country** code to "1000". Setting the country code to this value will automatically adjust the regulatory domain to match the configuration of the infrastructure. Do not set the country code to values other than "1000" unless otherwise instructed.

- set the **Security Mode** to **WPA (PSK)** and enter the **WPA password** (string between 8 and 63 characters).
3. Select **Main Setup** -> **WLAN Diagnostic** to access the service window.
  4. Proper installation of the IntelliVue 802.11 Bedside Adapter is assured by connecting to an access point over the wireless link. Place the monitor with the IntelliVue 802.11 Bedside Adapter installed in close proximity to the access point (e.g. if the access point is mounted on the ceiling, place the monitor directly below). Wait until the **Conn. Status** field in the service window shows *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher). Take the monitor approximately 5 m away from the access point. There should be no walls or other obstacles between the monitor and the access point. The following should apply:
    - Observe the **RSSI** (Received Signal Strength Indicator) value for at least 5 - 10 seconds. The **RSSI** value will fluctuate but should stay above 30 in a 5 m distance from the access point used. The wireless link should be active, i.e. the **Conn. Status** field should be *Authenticated* (for Rel. C.0 monitors) or *Connected* (for Rel D.0 or higher), and the other fields should contain values. If the **RSSI** value is significantly lower, check the distance to the access point and the antenna orientation at the monitor. The antenna orientation should be vertical, but the physical placement of the monitor or other equipment within its vicinity as well as walls or other obstacles may influence the antenna orientation required to receive the best RSSI value.
  5. If this test fails, retry in a different physical area with a different access point.
  6. Perform the Wireless Switch test blocks as described in the Philips IntelliVue 802.11 a/g Infrastructure Installation and Configuration Guide.

Test	Expected test results
IntelliVue 802.11 Bedside Adapter Performance Test	RSSI value above 30

## Reporting of Test Results

Philips recommends all test results are documented in accordance with local laws. Authorized Philips personnel report test result back to Philips to add to the product development database. While hospital personnel (biomedical engineers or technicians) do not need to report results to Philips, Philips recommends that they record and store the test results in accordance with local laws.

The following table lists what to record after completing the tests in this chapter. Record the results in the empty column in Table 16.

The following is a guide as to what your documentation should include:

- Identification of the testing body (for example, which company or department carried out the tests).
- Name of the person(s) who performed the tests and the concluding evaluation.
- Identification of the device(s) and accessories being tested (serial number, etc.).
- The actual tests (incl. visual inspections, performance tests, safety and system tests) and measurements required
- Date of testing and of the concluding evaluation.
- A record of the actual values of the test results, and whether these values passed or failed the tests.
- Date and confirmation of the person who performed the tests and evaluation.

The device under test should be marked according to the test result: passed or failed.

### Carrying Out and Reporting Tests

#### Test Report

Testing Organization: Name of testing person:	Test before putting into service (reference value) Recurrent Test  Test after Repair
Responsible Organization:	
Device Under Test:	ID-Number
Product Number:	Serial No.:
Accessories:	
Measurement Equipment (Manufacturer, Type, Serial No.):	
Functional Test (parameters tested):	

**Test and Inspection Matrix**

Test	Test or Inspection to be Performed	Expected Test Results	Record the Results (mandatory for Philips Personnel only)	
			What to record	Actual Results
Visual Inspection	Perform Visual Inspection	Pass or Fail	V:P or V:F	
Power On	Power on the unit. Does the self-test complete successfully	If Yes, Power On test is passed	PO:P or PO:F	
Noninvasive Blood Pressure Performance Tests	Perform the Accuracy Test	X1 = value displayed by monitor Difference $\leq 3$ mmHg	PN:P/X1 or PN:F/X1	
	Performance Leakage Test	X2 = leakage test value X2 $< 6$ mmHg	PN:P/X2 or PN:F/X2	
	Performance Linearity Test	X3 = value displayed by monitor Difference $\leq 3$ mmHg	PN:P/X3 or PN:F/X3	
	Performance Valve Test	X4 = value $< 10$ mmHg	PN:P/X4 or PN:F/X4	
Temperature Performance Test	Perform the Temperature Performance Test	X1 = $40^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$ or $100^{\circ}\text{F} \pm 0.4^{\circ}\text{F}$	PT: P/X1 or PT: F/X1	
All other performance tests	Perform the remaining parameter performance tests, if applicable	See expected results in test procedures	P: P or P: F	
Safety (1)	Perform Safety Test (1): Protective Earth Resistance	With mains cable: Maximum impedance (X1): $\leq 300$ mOhms	S(1):P/X1 or S(1):F/X1	
Safety (2)	Perform Safety Test (2): Equipment Leakage Current - Normal Condition.	With mains cable: Maximum leakage current (X1): $\leq 100 \mu\text{A}$	S(2): P/X1 or S(2): F/X1	

Test	Test or Inspection to be Performed	Expected Test Results	Record the Results (mandatory for Philips Personnel only)	
			What to record	Actual Results
Safety (3)	Perform Safety Test (3): Equipment Leakage Current - Single Fault Condition (Open Earth)	With mains cable: Maximum leakage current (X2): $\leq 300 \mu\text{A}$	S(3): P/X2 or S(3): F/X2	
Safety (4)	Perform Safety Test (4): Patient Leakage Current - Single Fault Condition, mains on applied part.	Maximum leakage current (X1): $\leq 50 \mu\text{A}$	S(4): P/X1 or S(4): F/X1	
System (Sys 1-2)	Perform the system test according to subclause 19.201 of IEC/EN 60601-1-1, if applicable, after forming a system	Equipment Leakage Current: Sys1 $\leq 100 \mu\text{A}$ (Normal Condition) Sys2 $\leq 300 \mu\text{A}$ (Single Fault Condition)	Sys: PSys1/PSys2 or Sys: FSys1/FSys2	
System (Sys 3)	Perform the system test according to subclause 19.201 of IEC/EN 60601-1-1, if applicable, after forming a system	Protective Earth Leakage Current if medical electrical system components are connected to the same Multiple Portable Socket Outlet: Sys3 $\leq 300 \mu\text{A}$	Sys: PSys3 or Sys: FSys3	
Key: P = Pass, F = Fail, X or Sys = test value to be recorded				

**NOTE**

All values for current and voltage are the root mean square (r.m.s.) values, unless otherwise stated.

**Evaluation**

	Yes	No
Safety and Functional Test passed		
Repair required at a later date, safety and functional test passed		
Device must be taken out of operation until repair and passed tests		
Device failed and must be taken out of operation.		

**Notes:****Next Recurrent Test:****Name:** \_\_\_\_\_**Date/Signature:** \_\_\_\_\_**Evaluation of Test Results**

The evaluation of the test results must be performed by appropriately trained personnel with sufficient product, safety testing and application knowledge.

If any test results are between 90% and 100% of the respective expected result, the previously measured reference values must be taken into consideration for the assessment of the electrical safety of the device under test. If no reference values are available, you should consider shorter intervals between upcoming recurrent tests.

**NOTE**

If any single test fails, testing must be discontinued immediately and the device under test must be repaired or labeled as defective. Be sure to inform the user about the test failure in writing.



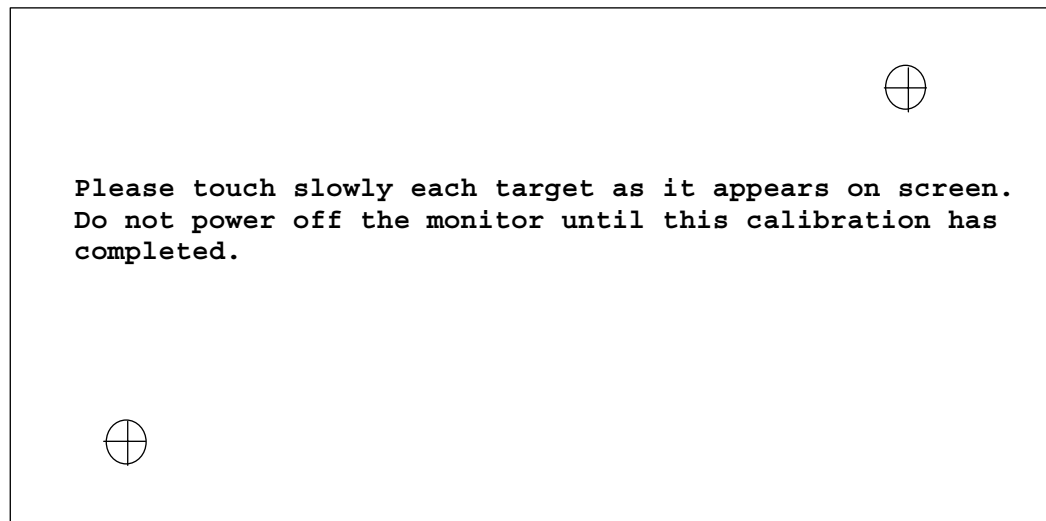
## Other Regular Tests

The care and cleaning requirements that apply to the monitor and its accessories are described in the Instructions for Use. This section details periodic maintenance procedures recommended for the monitor and its accessories.

## Touchscreen Calibration

To access the touchscreen calibration screen:

1. Enter service mode
2. Select **Main Setup**
3. Select **Hardware**
4. Select **Touch Calibration**



***Touchscreen Calibration Screen***

Make sure you complete the calibration procedure without powering off the monitor mid-way. If the monitor is powered off after the first point is touched, the touch panel will be deactivated until the touch calibration is performed again.

If the touchscreen is accidentally mis-calibrated by selecting the wrong spot, you must use another input device to re-enter calibration mode. If you have the support tool, you can select **Reset Touch Calibration to Default** and it will create a rough calibration which will allow you to access the calibration menu again via the touchscreen.

Please refer to the documentation shipped with your selected display for further details on touchscreen calibration procedures.

## Disabling/Enabling Touch Operation

There are two ways to disable/enable touchscreen operation:

1. To *temporarily* disable touchscreen operation of the monitor, press and hold the **Main Screen** key. A padlock symbol will appear on the key. Press and hold the **Main Screen** key again to re-enable touchscreen operation.
2. To *permanently* disable touchscreen operation:
  - a. Enter Service Mode.
  - b. Select **Main Setup**
  - c. Select **User Interface**
  - d. Change the **Touch Enable** selection to **no**.

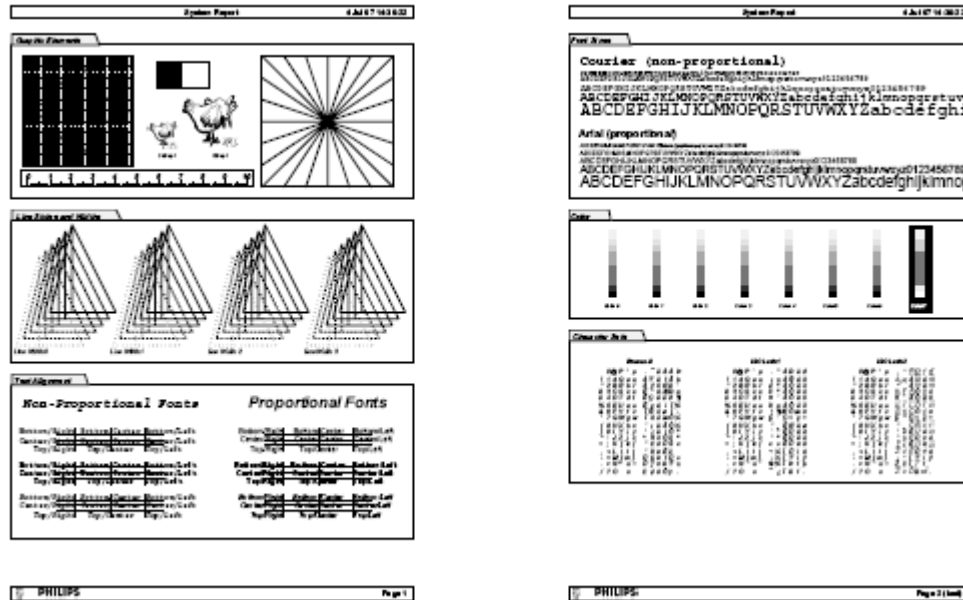
To re-enable touchscreen functionality change the **Touch Enable** selection to **yes**.

# Printer Test Report

To verify your printer configuration you may want to print a test report.

To print a test report select **Main Setup -> Reports -> Setup Printers -> Print Test Rep.**

Your test report should look like this:



## Battery Handling, Maintenance and Good Practices

This section provides some information on how to handle and maintain the batteries in order to get the best usage from them. Additionally, some good working practices are also given regarding the correct disposal of the batteries. This section only applies if a battery board is installed in the monitor.

### NOTE

If your monitor is connected to an -USR\_ProductName- Information Center, you should make sure that the IIC uses the text catalog revision B.1 or later, otherwise battery INOPs may not display correctly on the IIC. Consult your IIC documentation for instructions on upgrading the text catalog.

## About the Battery

The rechargeable Lithium-Ion batteries used in the monitor are regarded as *Smart* batteries because they have built-in circuitry. (This circuitry communicates battery-status information to the Monitor.)

To get the most out of the batteries, observe the following guidelines:

- Condition the batteries only upon maintenance request prompt on display.
- **If a battery shows damage or signs of leakage, replace it immediately. Do not use a faulty battery in the Monitor.**
- Capabilities of integrated battery charger: 12.6V, 5 Amps mx.  
Actual current / voltage: depends on smart battery request and monitor configuration  
The approximate charging time is 4 hours with the monitor switched off and up to 12 hours during monitor operation, depending on the monitor configuration.
- **Battery Disposal**—Batteries should be disposed of in an environmentally-responsible manner. Consult the hospital administrator or your local Philips representative for local arrangements.  
**Do not dispose of the battery in normal waste containers.**
- **Battery Storage** — Batteries should not remain inside the monitor if they are not used for a longer period of time. Batteries should be max. 50% charged for storage.

### NOTE

Batteries will discharge within about 20 days if they are stored inside the monitor without AC power connection.

## Checking the Battery Status

When the Monitor is connected to the AC power supply, the battery charges automatically. The battery can be charged remotely from the Monitor by using the battery charger. Use only Lithium Ion battery chargers approved by Philips.

Battery status (level of charge) is indicated several ways:

- LED on the front panel of the Monitor.
- Battery gauge.
- Display of battery time below gauge.
- Battery status window.
- INOP messages.

The AC Power LED is only on when the power cord is connected and AC power is available to the Monitor. In this case, the battery can be either charging or fully charged.

The battery LED can be green, yellow, or red depending on the following conditions:

Battery LED Colors	If the monitor is connected to AC power, this means	If the monitor is running on battery power, this means
<b>Green</b>	batteries full (>90%)	
<b>Yellow</b>	batteries charging (battery power < 90%) or battery down <sup>2</sup>	
<b>Red, flashing</b>		less than 10 minutes power remaining
<b>Red, flashes intermittently</b>	battery malfunction <sup>1</sup>	battery malfunction <sup>1</sup>
<b>Red, flashes once when on/standby switch is pressed</b>		not enough battery power left to power monitor

<sup>1</sup> indicated by malfunction symbol and INOP

<sup>2</sup> indicated by “battery has no power left” symbol

### NOTE

If the batteries were charged to 100%, they will not charge again until the charging status goes below 90%.

If the remaining battery-operating time is less than 10 minutes, the LED flashes red at a repetition rate of approximately 1.5 flashes per second.

When the batteries are empty, the Monitor switches off automatically (including the green On-Off/Standby LED on the front panel). Attempts to restart the Monitor (by pressing the On-Off/Standby) causes the red LED to emit a single flash. (The flash may have a delay of up to 2.5 sec after pressing the On-Off/Standby key). In this case either recharge the batteries (externally or internally) or exchange the batteries.

**NOTE**

If the batteries become too warm or too cold, they will not begin the recharging cycle until the battery temperature is within range.

**Battery Status on the Main Screen**

Battery status information can be configured to display permanently on all Screens. It shows the status of each of the batteries and the combined battery power and battery time remaining. These symbols are displayed if a battery board is installed, no matter whether batteries are inserted or not.

Battery status symbols:











These symbols tell you the status of the batteries detected and which battery compartment they are in, either 1 or 2.

Battery power gauge:

This shows the remaining battery power in the combined batteries. It is divided into sections, each representing 20% of the total power. If three and a half sections are shaded, as in this example, this indicates that 70% battery power remains. If no batteries are detected, the battery gauge is greyed out.

Battery malfunction symbols:

If a problem is detected with one of the batteries, these symbols alternate with the battery number to indicate which battery is affected. They may be accompanied by an INOP message or by a battery status message in the monitor information line (if battery window is open) providing more details.

Battery status symbols			Battery malfunction symbols		
					
Battery 1 is present	Battery compartments are empty	Battery requires maintenance	Incompatible battery (Battery 1)	Battery malfunction (Battery 1)	Battery 2 is missing, insert battery
					
battery is empty	battery not charging as the temperature is above or below the specified range			(red) battery temperature too high	Battery 2 has no power left

Explanations of Battery Status and Malfunction Symbols:

*Battery requires maintenance:* The batteries require conditioning. Refer to “Conditioning Batteries” for details.

*Incompatible Battery:* The inserted batteries are checked for certain battery internal parameters. If these are not correct, the incompatible battery symbol is displayed. Please use only the M4605A batteries with the -USR\_ProductName- monitor. Note that the incompatible battery symbol may also appear if there is a communication problem between the battery and the battery board.

*Temperature outside specified range:* The charging of the battery is stopped if the temperature is below 15°C or above 50°C in order to protect the battery. Charging is resumed as soon as the temperature is within this range.

*Battery Temperature too high:* This symbol is displayed if the battery temperature goes above 65°C. In addition the INOP message CHECK BATT TEMP is displayed. If the battery temperature increases further above 70°C the batteries will switch off for safety reasons. Allow the batteries to cool down to avoid the monitor switching off.

*Battery is empty:* The capacity of the battery is  $\leq 200$  mAh. Recharge the battery as soon as possible.

*Battery has no power left:* Either the battery has switched off power delivery but is still communicating with the battery board - in this case recharge the battery immediately - or the battery is in deep discharge, i.e. it has switched off power delivery, has stopped communicating with the battery board and requires pre-charging to restore communication. The INOP CHARGE BATT 1/ BATT 2 is issued to indicate that pre-charging is required. To avoid this condition charge batteries to 50% for storage. Note that the battery malfunction INOP will eventually be issued if the pre-charging does not restore battery communication within about 10 minutes.

#### NOTE

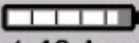
*Battery Malfunction:* Communication between the battery and the battery board could not be established within about 10 minutes or battery internal data indicates malfunction. Please see the “Troubleshooting” section for remedies.

#### NOTE

If both batteries are malfunctioning or incompatible or require pre-charging and the monitor is not connected to AC power, it will switch off automatically for safety reasons.

### Battery Status Window

- To access the **Battery Status** window and its associated pop-up keys, select the battery status information on the Screen, or select **Main Setup -> Battery**.

Battery Status			
		TimeToFull: 0:31 hrs	
Capacity		Batt 1	Batt 2
remaining	[mAh]	3856	4044
fullCharge	[mAh]	4630	4716
Voltage	[V]	12.47	12.45
Current	[mA]	1336	1413
Temperature	[°C]	35.1	34.6



**Capacity, Remaining** tells you how much power is left in each battery.

**Capacity, Full Charge** tells you how much power each battery can hold when fully charged.

**Time To Empty** tells you approximately how long you can continue to use the monitor with these batteries. Note that this time fluctuates depending on the system load (how many measurements and recordings you carry out), the age of the battery, and the remaining capacity of the battery. The time indication is blanked after unplugging AC or after changing batteries for about 30 seconds (during calculation of the Time to Empty)

**Time To Full** is shown in place of **Time To Empty** if the monitor is connected to AC power, and tells you how much time is left until the batteries are charged to 90%. Please allow indication to stabilize for 3 to 5 minutes after beginning the charging cycle. If batteries are charged over 90% **Batteries Full (>90%)** is displayed until they are charged to 100%. Then **Batt1/Batt2 Fully Charged** is displayed.

### Viewing Individual Battery Status

- ▶ To view information for individual batteries, select the pop-up key **Battery 1** or **Battery 2**.

Batt 1		×
Model	PHILIPS M4605A	
Chemistry	LION	
ManufactureDate	3 Dec 03	
S/N	00326	
Type	10. 80V / 6000mAh	
Request	12. 60V / 4500mAh	
Cycles	49 ( 2% )	

### Documenting Battery Status

To print all battery information in the **Battery Status** window,

1. Select the battery status information on the Screen or select **Main Setup -> Battery** to open the **Battery Status** window
2. Select the **Record Status** pop-up key to print the information on a connected recorder  
or  
Select the **Print Status** pop-up key to print the information on a connected printer.

## Conditioning a Battery

### What is Battery Conditioning?

Battery conditioning recalibrates the battery to ensure that it has accurate information on the actual battery capacity.

### Why is Battery Conditioning Necessary?

The capacity of a battery decreases gradually over the lifetime of a battery. Each time a battery is charged its capacity decreases slightly. Therefore, the operating time of a monitor running on batteries also decreases with each charge cycle.

Battery conditioning ensures that the value stored in the battery for its full capacity takes account of this decrease, so that the remaining battery charge can be calculated accurately, and the low battery warning given at the right time.

### When Should Battery Conditioning be Performed?

Battery conditioning should be performed when indicated by the Battery Status.

#### NOTE

When the battery status signals a conditioning request, the displayed **Time to Full** or **Time to Empty** may not be reliable.

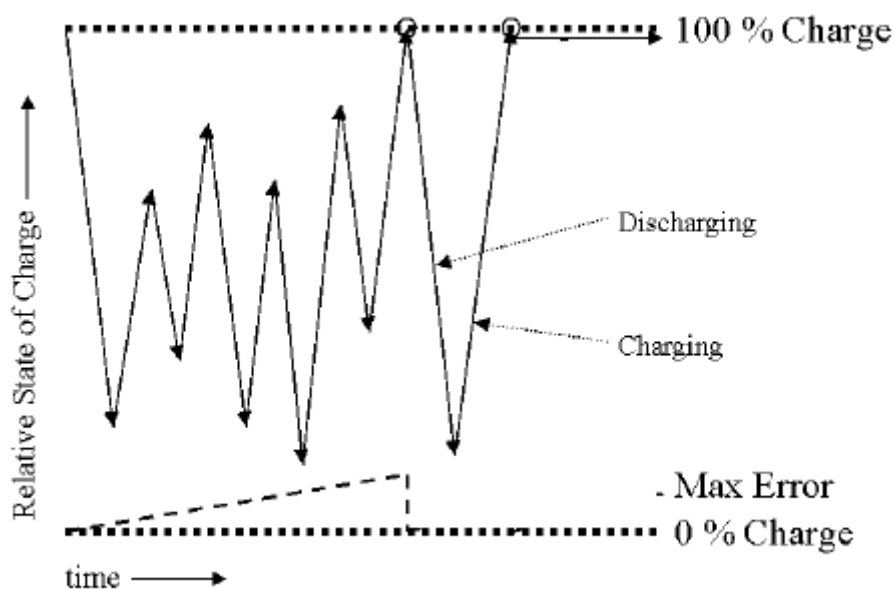
### What Causes the Conditioning Message on the Monitor?

In addition to the value for the full capacity, the battery also stores a value for the Max Error. The Max Error tracks the maximum possible deviation of the estimated charge of a battery from the actual charge.

If a battery is charged or discharged partially, or if it is charged while the monitor is being used, the accuracy of the “reference points” for the fully discharged and fully charged states decreases, causing an increase in the value for the Max Error (see diagram, below).

When the Max Error rises over a certain limit, a message is displayed prompting the user to condition the battery, as described in Conditioning Batteries.

You can reset the value for the Max Error before the battery needs conditioning, by performing the steps described in “Conditioning Batteries”. The minimum value of the Max Error after conditioning is 2%.



### Conditioning Batteries

Battery conditioning can either be performed in the monitor or with an external battery charger.

#### Battery Conditioning in the Monitor

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**CAUTION**

Do not use a monitor being used to monitor patients to condition batteries. The monitor switches off automatically when the batteries are empty.

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You should condition a battery when its “battery requires maintenance” symbol shows on the Screen. If conditioning is not performed immediately the monitor will still function according to specifications. However, the displayed time to empty and time to full will show increasing inaccuracy. Do not interrupt the charge or discharge cycle during conditioning. To condition a battery,

1. Insert the battery into a monitor connected to mains power.
2. Charge the battery until it is completely full. Switch the monitor off to decrease the charging time. When the battery LED turns green i.e. the batteries are >90% charged, switch on the monitor and open the **Battery Status** window. Check that the **Batteries fully charged** or **Battery 1 / Battery 2 fully charged** message is displayed.
3. Disconnect the monitor from mains power, and let the monitor run until the battery is empty and the monitor switches itself off.
4. Reconnect the monitor to mains power and charge the battery until it is full for use or charge to 50% for storage.

### **Battery Conditioning with an External Charger**

You can use the M8043A Smart Battery Charger for external battery conditioning. For details please see the IfU for the Smart Battery Charger.

## **After Installation, Testing or Repair**

Before handing the patient monitor over to the end-user, make sure it is configured appropriately and that it is in monitoring mode. Ensure that the user receives the current revision of the monitor documentation.





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# Troubleshooting

## Introduction

This section explains how to troubleshoot the monitor if problems arise. Links to tables that list possible monitor difficulties are supplied, along with probable causes, and recommended actions to correct the difficulty.

## How To Use This Section

Use this section in conjunction with the sections *Testing and Maintenance* and *Parts*. To remove and replace a part you suspect is defective, follow the instructions in the section *Repair and Disassembly*. The *Theory of Operation* section offers information on how the monitor functions.

## Who Should Perform Repairs

Only qualified service personnel should open the monitor housing, remove and replace components, or make adjustments. If your medical facility does not have qualified service personnel, contact Philips' Response Center or your local Philips representative.

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### WARNING

High Voltage - Voltages dangerous to life are present in the instrument when it is connected to the mains power supply. Do not perform any disassembly procedures (other than server removal) with power applied to the instrument. Failure to adhere to this warning could cause serious injury or death.

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## Replacement Level Supported

The replacement level supported for this product is to the printed circuit board (PCB) and major subassembly level. Once you isolate a suspected PCB, follow the procedures in the *Repair and Disassembly* section, to replace the PCB with a known good PCB. Check to see if the symptom disappears and that the monitor passes all performance tests. If the symptom persists, swap back the replacement PCB with the suspected malfunctioning PCB (the original PCB that was installed when you started troubleshooting) and continue troubleshooting as directed in this section.

## Software Revision Check

Some troubleshooting tasks may require that you identify the Software Revision of your monitor. You can find the software revision along with other information, such as the system serial number, in the monitor revision screen. To access the monitor revision screen:

1. Enter the Main Setup menu and select **Revision**
2. Select **Product**
3. Select **Software Revision**
4. Select the pop-up key for the device you want to check (e.g. **M8002A** or **M3001A**)

### NOTE

The part numbers listed in the monitor revision screen do not necessarily reflect the part numbers required for ordering parts. Please refer to the *Parts* section for the ordering numbers.

### NOTE

The system serial number can also be found on the lower right corner on the front of the monitor.

\*\* For further information on M3001A HW/SW compatibility, please refer to the *Parts* section.

## Obtaining Replacement Parts

See *Parts* section for details on part replacements.

## Troubleshooting Guide

Problems with the monitor are separated into the categories indicated in the following sections and tables. Check for obvious problems first. If further troubleshooting instructions are required refer to the *Troubleshooting Tables* (on page 123).

Taking the recommended actions discussed in this section will correct the majority of problems you may encounter. However, problems not covered here can be resolved by calling Philips Response Center or your local representative.



## Checks for Obvious Problems

When first troubleshooting the instrument, check for obvious problems by answering basic questions such as the following:

1. Is the power switch turned on?
2. Is the battery adequately charged?
3. Is the AC power cord connected to the instrument and plugged into an AC outlet?
4. Are the MMS and, if present, the MMS Extension inserted correctly?

## Checks Before Opening the Instrument

You can isolate many problems by observing indicators on the instrument before it is necessary to open the instrument.

### NOTE

It takes several seconds for the AC Power LED to switch on / off after the mains power cord has been connected / disconnected.

## Checks with the Instrument switched Off

- AC connected, without battery:
  - AC Power LED is on (green).
- AC connected, with battery:
  - AC Power LED is on (green).
  - Battery LED is green if fully loaded, yellow if being charged and off if only one battery is inserted and fully charged.
  - Battery LED red and blinking signals battery malfunction.
- No AC connected, with battery:
  - All LEDs are off.

## Checks with the Instrument Switched On, AC connected, without battery

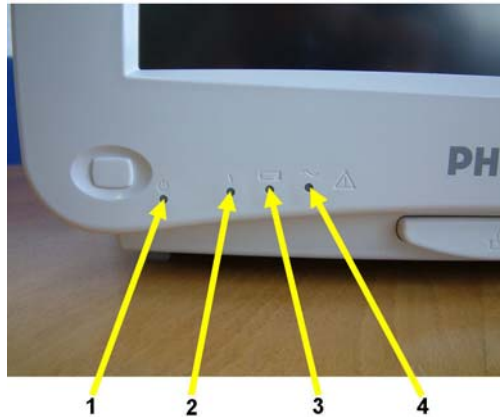
When the monitor is first switched on, the Power On LED and the AC Power LED switch on and stay on. The Error LED and the Battery LED light up momentarily.

## Checks with the Instrument switched On, AC connected, with battery

When the monitor is first switched on, the Power On LED and the AC Power LED switch on and stay on. The Error LED and the Battery LED light up momentarily. Before and after the Battery LED flashes it shows the current battery status as described in the Testing and Maintenance section.

### Checks with the Instrument switched On, AC not connected, with battery

When the monitor is first switched on, the Power On LED switches on and stays on. The AC Power LED, the Error LED and the Battery LED light up momentarily.



No.	Description
1	Power On LED (Green)
2	Error LED (Red)
3	Battery LED (Green/Red/Yellow)
4	AC Power LED (Green)

### Initial Instrument Boot Phase

The following tables describe the regular initial boot phase of the monitor and its components. If the boot phase does not proceed as described below go to Boot Phase Failures for Troubleshooting information.

Monitor Boot Phase:

For these steps it is assumed that the Monitor is powered correctly and the +3,3 V System Board supply voltage is okay. This is indicated by the green Power On LED.

Time (sec.) after Power On	Event
0	When the Power On/Off button is pressed, the green Power On LED and the red error LED switch on immediately.
3	The alarm LEDs are switched on with low intensity. Colors: Left LED:cyan; Middle LED:red; Alarm Suspend LED (right): red. Red Error LED is switched off.
5	Boot Screen with the Philips Logo appears on the display. Test Sound is issued.
9	All Alarm LEDs are switched off.

Time (sec.) after Power On	Event
10	<p>Alarm LEDs are tested in the following sequence:</p> <p>Cyan on-off (left LED only)</p> <p>Yellow on-off (left &amp; middle LED)</p> <p>Red on-off (all LEDs)</p> <p>Boot Screen with the Philips Logo disappears</p> <p>Fixed screen elements (for example smart keys, alarm fields) appear on the screen.</p>
15-30	<p>First measurement information appears on the screen, user input devices (for example Mouse, Touch, NavigationPoint) are functional</p>

## Troubleshooting Tables

The following tables list troubleshooting activities sorted according to symptoms. Click on the links below to view a particular table.

## How to use the Troubleshooting tables

The possible causes of failure and the remedies listed in the troubleshooting tables should be checked and performed in the order they appear in the tables. Always move on to the next symptom until the problem is solved.

Boot Phase Failures

***Integrated Display is blank*** (on page 127)

***Integrated Touch Display not functioning*** (on page 128)

***External Display is blank (Slave Display)*** (on page 128)

External Touch Display not functioning

Remote Alarm Device

***Remote Extension Device*** (on page 291)

***Navigation Point*** (on page 132)

***Keyboard/Mouse not functioning*** (on page 132)

Battery related problems

Network related problems

Wireless Ethernet Adapter (Proxim)

Multi-Measurement Module

MSL-related problems

Alarm Lamps

Alarm Tones

Individual Parameter INOPS

Printer

MIB / RS232

Flexible Nurse Call Relay

**Boot Phase Failures**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
AC LED does not light up	AC Connection not ok	Check that the AC-Mains are powered and the power cord is ok and connected
	Carrier Power on LED PCA not connected to the main board	Check if Carrier Power on LED PCA is connected correctly to the Main Board
	Carrier Power on LED PCA defective	Exchange Carrier Power on LED PCA
	Main Board defective	Exchange Main Board
	Power supply defective	Exchange Power Supply
Green Power On LED and Red Error LED remain off after pressing power on button:	Remote Devices	Disconnect all connections to the remote devices and try to switch on the monitor again
	Power Switch Micro Controller hung	Unplug AC Mains and replug after 10 seconds. Try to switch on the monitor again.
	Carrier Power on LED PCA not connected to the main board	Check if Carrier Power on LED PCA is connected correctly to the Main Board
	I/O Board defective	Remove all I/O boards and try to switch the monitor on again
	Touch controller defective Flex adapter cable defective MSL board defective Recorder PCA defective Battery PCA defective IIT module defective	Disconnect cables and boards: (except Power DC/DC cable): - Flex adapter cable - MSL - Recorder PCA - Battery PCA - IIT module then try to switch on the monitor again.
	Carrier Power on LED PCA defective	Exchange Carrier Power on LED PCA and try to switch the monitor on again.
	Main Board defective	Exchange main board. Add boards in reverse order and try again with each board.

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Green On/Standby LED or Red Error LED remain off after pressing Power on button:	Carrier Power on LED PCA defective	Exchange Carrier Power on LED PCA
	Main board defective	exchange main board
Red Error LED stays on continuously	External connected device defective	disconnect all external cables (except AC) and switch the monitor on again
	I/O Board defective	Remove all I/O boards and switch the monitor on again.
	Touch controller defective Flex adapter cable defective MSL board defective Recorder PCA defective Battery PCA defective IIT module defective	Disconnect cables and boards: (except Power DC/DC cable): - Flex adapter cable - MSL - Recorder PCA - Battery PCA - IIT module then try to switch on the monitor again.
	Measurement Server Mount defective	Disconnect Measurement Server Mount and switch on again
	Main board defective	Exchange Main board
Red Error LED blinks (indicating cyclic reboots)	Hardware Failure	connect Support Tool directly to monitor with crossover cable and start “search for defective devices”  If no device is detected, proceed as described above in section “Red error LED stays on continuously”
	Software Fault	If the Support Tool can detect the device and it indicates the Operating Mode is ‘Boot’, download and store the status log. Reload software and re-clone the monitor. If this fixes the problem e-mail the status log to your local response center
	Hardware Failure	If this does not rectify the problem follow instructions under “Red Error LED stays on continuously”.

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Alarm LEDs remain off:	Main board defective	Exchange Main board
No Test Sound issued	Speaker defective	check for INOPs and follow instructions exchange speaker
	Main board defective	exchange main board

### Integrated Display is blank

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Integrated display is blank or brightness is reduced (The information listed in this table is only valid if the boot phase has completed without error. See Boot Phase Failures table for a description of the Boot phase.)	Display brightness is reduced when room temperature, or instruments placed near patient monitor, causes the monitor display to overheat.	Instrument should be placed in an environment that does not exceed 40 degrees C or below 5 degrees C.
		If you have an external display, connect it to the video port. If the external display works, you can eliminate the main board as the cause of failure.
	Flat Panel Adapter flex not connected	Check flex connection of Flat Panel Adapter Board to main board and display
	Backlight Inverter Cable not connected	Check cable connection of Flat Panel Adapter Board to Backlight Inverter Board
	Backlight tubes defective	Replace backlight tubes
	Backlight Inverter board defective	If backlight tubes have already been replaced, replace backlight inverter board.
	Flat Panel Adapter flex defective	Replace Flat Panel Adapter flex
	LCD Flat panel defective	Replace LCD Flat panel

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
	Main board defective	Replace main board

### Integrated Touch Display not functioning

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Touch Screen not functioning	Touchscreen functionality has been temporarily disabled	Check if touchscreen functionality has been temporarily disabled (padlock symbol on Main Screen key). If yes, press and hold the Main Screen key to re-enable touchscreen operation.
	Touchscreen functionality has been permanently disabled	In service mode, select Main Setup -> User Interface and change the "Touch Enable" selection to "yes".
	HIF PCA not connected	Check connection from HIF PCA to main board
	Touch panel cable not connected	Check connection from HIF PCA to touch panel
	HIF PCA or touch sensor defective	Replace HIF PCA and touch sensor
	Main board defective	Replace main board
Touch Position invalid	Touch not calibrated	Perform touch calibration: 1. Enter the Main Setup Menu 2. Select Hardware 3. Select Touch Calibration



**External Display is blank (Slave Display)**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
External Display is blank		If integrated display is also blank proceed as described under “Integrated Display is blank”
	Video cable to external display not connected or defective	Check video cable connection to external display
	External display has no power	Check electricity supply of external display
	External display is defective	Check external display and video cable on another monitor or PC
	System Interface board defective	Replace System Interface board
	Main board defective	Replace main board

**External Touch Display not functioning**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
External Touch Screen not functioning	Touchscreen functionality has been temporarily disabled	Check if touchscreen functionality has been temporarily disabled (padlock symbol on Main Screen key). If yes, press and hold the Main Screen key to re-enable touchscreen operation.
	Touchscreen functionality has been permanently disabled	In service mode, select Main Setup -> User Interface and change the “Touch Enable” selection to “yes”.
	External Touch cable not connected	Check cable connection from external touch to MIB board

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
	External Touch driver configuration	Check RS232/MIB configuration: 1. Enter Main Setup menu 2. Select Monitor 3. Select Hardware 4. Reconfigure RS232/MIB drivers 5. if problem persists, proceed to the next step
	MIB Board defective	Replace MIB board
	External touch defective	Replace external touch
	Main board defective	Replace Main board
Touch position invalid	Touch not calibrated	Perform touch calibration: 1. Enter Main Setup menu 2. Select Hardware 3. Select Touch Calibration

### General Monitor INOP Messages

INOP Message	Possible Causes of Failure	Failure Isolation and Remedy
CHECKINTERNVOLTA GE CHECK MONITOR FUNC	Problem with too low voltages (5V, 12V) in the monitor. Alarm lamps, display or interfaces may not function correctly.	Remove all I/O boards and put them back in one at a time to isolate any defective board. If this does not resolve the problem, replace the main board
CHECK MONITOR TEMP	The temperature inside the monitor is too high	Check the environment for possible causes
	Monitor ventilation obstructed	Clean the monitor ventilation internally and then cool monitor down for 8 hours
	Main Board defective	replace Main Board
SETTINGS MALFUNCTION	Problem during cloning process.	Reclone configuration file
	Memory space in which the settings are stored has been corrupted	Reclone configuration file. This will reload the memory space.
	Main board defective	Replace Main board

**Remote Alarm Device**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Alarm LEDs illuminate, but no alarm sound is issued	speaker defective	replace Remote Alarm Device
	remote device I/F defective	replace I/O board
Alarm occurs on screen, but no LED or alarm sound on the alarm device	cabling not connected	check cabling
	cabling defective	replace cable
	I/O board defective	replace I/O board
	Remote Alarm Device defective	replace Remote Alarm Device
Alarm sound is issued, but no LEDs light up	LED failure	Replace Remote Alarm Device

**Remote Extension Device**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Remote input device (for example mouse/keyboard) attached to the Remote Extension Device does not function	Remote Extension Device is not connected to the monitor.	Check cabling and connections
	Input Device not connected properly	Check cabling to Input Device in the Remote Extension Device
	Input Device defective	Replace Input Device
	Remote Extension Device defective	Replace Remote Extension Device
	Remote Device I/O board defective	Replace I/O board
Buttons on the Remote Extension Device do not function but input device attached is functioning	Remote Extension Device defective	replace Remote Extension Device

**Navigation Point**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Navigation Point attached directly to the monitor not functioning	Navigation Point not connected properly	Check cabling
	Navigation Point defective	Replace Navigation Point
Speed Point attached to Remote Extension Box not functioning	Remote Extension Device is not connected to the monitor.	Check cabling and connections
	SpeedPoint not connected properly	Check cabling to SpeedPoint in the Remote Extension Device
	SpeedPoint defective	Replace SpeedPoint
	Remote Extension Device defective	Replace Remote Extension Device
	Remote Device I/O board defective	Replace I/O board
Navigation Point Knob Rotation or Selection control not functioning	Navigation Point defective	Replace Navigation Point
INOP Message CHECK INPUT DEVICES is issued	Navigation Point or other input device defective	Perform a visual and functional check of all the monitor input devices. Replace input devices if necessary.

**Keyboard/Mouse not functioning**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Keyboard/Mouse attached directly to the monitor not functioning	Keyboard/Mouse not connected properly	Check cabling
	Keyboard/Mouse defective	Replace Keyboard/Mouse
	PS/2 or USB I/O Board defective	replace I/O board

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Keyboard/Mouse attached to Remote Extension Box not functioning	Remote Extension Box is not connected to the monitor or Input Device is not connected to Remote Extension Box	Check cabling and connections
	Keyboard/Mouse defective	Replace Keyboard/Mouse
	Remote Extension Device defective	Replace Remote Extension Device
	Remote Device I/O board defective	Replace I/O board











### Battery related problems

Symptoms	Causes of Failure	Failure Isolation and Remedy
Battery symbol is not displayed	The monitor is not configured for battery operation.	Make sure a battery board is installed.
<b>BATTERIES EMPTY</b> or <b>BATT 1/BATT 2 EMPTY</b> INOP tone, battery LED flashes During this INOP, alarms cannot be paused or switched off.	The estimated remaining battery-powered operating time of the indicated battery or batteries is less than 10 minutes.	Insert full batteries or recharge the batteries immediately.  If the condition persists, this INOP is re-issued two minutes after you acknowledge it.
<b>BATTERIES INCOMPAT</b> or <b>BATT 1/BATT 2 INCOMPAT</b> INOP tone	The indicated batteries cannot be used with this monitor.	Replace with the correct batteries (M4605A).
	Communication problem between battery and battery board.	Check batteries in a different monitor. If INOP persists replace batteries.
		Check battery board using known good batteries. If INOP persist, replace battery board.
<b>BATTERIES LOW</b> or <b>BATT 1/BATT 2 LOW</b> INOP tone	The estimated battery-powered operating time remaining is less than 20 minutes.	Insert full batteries or recharge the batteries.
<b>BATTERIES MALF</b> or <b>BATT 1/BATT 2</b>	The monitor cannot determine the battery status or there is a	Replace the faulty battery or batteries. If the condition

Symptoms	Causes of Failure	Failure Isolation and Remedy
<b>MALFUNCTION</b> INOP tone, battery LED flashes During this INOP, alarms cannot be paused or switched off if the monitor is not connected to mains power.	communication problem between the battery and the battery board.	persists and the monitor is not connected to AC power, this INOP is re-issued two minutes after you acknowledge it.  Check the batteries in a different monitor or in a battery charger. If the INOP persists the battery is faulty.  Check the battery board with known good batteries. If the INOP persists, replace battery board..
<b>CHARGER MALFUNCTION</b> INOP tone, battery LED may flash	There is a problem with the battery charger in the monitor.	Switch the monitor off and back on again. If the problem persists replace batteries with known good batteries. If the INOP is shown again replace the battery board. If the problem persists replace the main board.
<b>CHECK BATT TEMP</b> INOP tone	The temperature of one or both batteries is too high.	Check that ventilation openings are not blocked and monitor is not exposed to heat.
<b>CHARGE BATT1/BATT2</b> INOP tone	Battery is deeply discharged and/or does not communicate and requires pre-charging.	Connect the monitor to AC power.

## Bedside Network Status Icons

The following table shows the icons displayed on the monitor when network related issues occur.

Wireless Icon	Wired Icon	Inverse Video	Blinks	Icon Comments	Inop Message	What does it mean?
No Icon	No Icon	-	-	-	-	MONITOR does not have a LAN connection (Wireless MONITOR cannot find an access point to talk to, wired MONITOR cannot hear anything on its LAN connection)
		Yes	Yes	Central - outline only	"UNSUPPORTED LAN" (after 1 minute)	MONITOR has a LAN connection but does not have an IP address assignment (Wireless MONITOR has found an access point to talk to, wired MONITOR hears traffic on the LAN)
		No	No	Central - outline only	"NO CENTRAL MONITORING"	MONITOR is connected to the LAN and has an IP address assignment, but the bed is not being monitored at the central 1. MONITOR is not assigned to a sector 2. There is another monitor on the network with the same "Equipment Label"
		No	No	Central - solid box	-	Normal Operation - MONITOR assigned to a sector and is being monitored by a central
-		No	No	Central - solid box, network line extended	-	Normal Operation - MONITOR assigned to a sector and is being monitored by a central This monitor also has OVERVIEW functionality on other beds
	-	No	Yes	Central - solid box	"WIRELESS OUT OF RANGE"	Wireless MONITOR that currently is being monitored by a central is losing contact with the access point and cannot find another to talk to
		Yes	Yes	Central - outline only, line for broken connection to central	"NO CENTRAL MONITORING"	Monitor lost connection to the Information Center: 1. LAN cable was disconnected 2. Information Center was disconnected 3. Network infrastructure failure (switch, etc.) 4. Out of range (wireless MONITOR)

## Network related problems

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Prompt Message "no central assigned to this bed" is issued	The monitor label is not set in the monitor (if the beds are "monitor labeled" in the Philips Information Center)	Set Monitor Label in Config Mode
	Problem with the Philips Information Center to Switch communication (if the beds are "port mapped" in the Philips Information center)	Check PIC to Switch communication, Switch configuration and Firmware status
INOP "Unsupported LAN" is issued. One of the following icons is displayed.	Network failure	Check if network switches, Philips Information Center and Database Server are all running and connected to the network

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
	Monitor connected to wrong network	Check if monitor has been connected for example to a different hospital network instead of the Philips Clinical Network
	IP address conflict after infrastructure re-installation	Reboot Database Server and Philips Information Center
No connectivity to PIC, no prompt or error message on monitor	Hardware Defect	Check LAN cable connection
		Check System Interface Board in Monitor
		Check network switch
	Configuration problem	Check switch configuration and firmware revision
Other Bed Overview not available	Configuration Problem	Check configuration in PIC regarding other bed overview (care group assignment)
		Verify configuration of switch (setting of multicast filters)
	This function is not available for wireless beds	Switch to a wired configuration
“Other Bed” Alarms are not appearing	Configuration problem	Verify configuration in PIC, in Monitor (Config Mode) and check that the feature is not temporarily disabled by the user (Bed Info Window)



**Wireless Ethernet Adapter (Proxim)**

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
No central monitoring possible (see also Network related problems)	Monitor is out of range of the access point (in this case the yellow sync LED on the wireless adapter on the bottom of the device next to the power connector is not on steady)	Move monitor back into coverage area
		Verify size of coverage with the site survey tool
	Wireless Adapter has no power (LEDs on adapter are all off)	Check splitter cable and replace if necessary
		Check System Interface Board in monitor and replace if necessary
		Check adapter itself. Replace if necessary
	(Only after first install) Firmware revision in adapter is wrong	Update adapter firmware with wireless support tool
	Wireless adapter defective (the red status LED on the adapter's top panel is on)	Replace wireless adapter
No connectivity (coverage area consists of multiple access points and in some parts of the area there is no connectivity)	Wrong configuration in wireless adapter or in access point	Check configuration with wireless support tool
	Configuration problem	Verify the channel, domain and security ID settings of the access points in the coverage area

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Frequent dropouts and network disconnects	Excessive interference by other radio equipment or by microwave ovens	Check statistics that can be read from the wireless adapter via RS232 or via logging application in the PIC. Remove interfering equipment.
	System capacity exceeded in coverage area	Check configuration guidelines for number of monitors per access point.
	Configuration problem	Check access point configuration with wireless support tool, in particular the multicast filters
Overview, Printing does not work	Some functions are not available on a wireless network	Connect to cabled network

### IIT-related Problems

Symptoms	Cause of Failure	Failure Isolation and Remedy
No Network icon or Network icon flashes. No association to central station.	Communication problem between the monitor and the IIT adapter. MAC Instr. Tele. field in Instrument Telemetry Service Window is 0000 0000 0000	Check that RF Access Code is set correctly and the network is correctly set up.  Check the flat cable connection between the main board and the IIT module.  Check the antenna cable connection between the IIT module and the antenna..
	Incorrect RF Access Code. No IP Address.	Check that RF Access Code is set correctly. Make sure that network is set up correctly.

**IntelliVue 802.11 Bedside Adapter Problems**

Symptoms	Cause of Failure	Failure Isolation and Remedy
No Network icon or Network icon flashes. No association to central station.	Communication problem between the monitor and the IntelliVue 802.11 Bedside Adapter or RSSI value below 30.	Ensure that the network infrastructure is functioning properly. See Troubleshooting tables in the IntelliVue 802.11 a/g Infrastructure Installation and Configuration Guide for details.  Check the antenna cable connection on the I/O board.  Check the cable connection between the IntelliVue 802.11 Bedside Adapter and the system interface board.  Replace cable, antenna or IntelliVue 802.11 Bedside Adapter if necessary.
	Configuration problem.	Make sure that the Mode, SSID, Country and Security settings in the Setup WLAN menu match your installation

Symptoms	Cause of Failure	Failure Isolation and Remedy
LEDs on IntelliVue 802.11 Bedside Adapter are off and remain off	Communication problem	<p>Check that the cable connection between the IntelliVue 802.11 Bedside Adapter and the system interface board is correct.</p> <p>Disconnect and reconnect the cable and try again. If problem persists, switch monitor off and on again. If problem persists, exchange cable and or IntelliVue 802.11 Bedside Adapter. If the new adapter does not function either, exchange system interface board.</p> <p>When functioning correctly, The LEDs on the bedside adapter should both light up for about 3 seconds after the monitor is switched on or the bedside adapter is first connected to the monitor. If the wireless LAN functionality has been disabled permanently both LEDs will remain off during monitor operation. In this case, to check the electrical connection, power-cycle the monitor and observe the LEDs on the adapter.</p>

### Multi-Measurement Module

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Prompt message “Measurement Server Configuration not supported” is issued	An unsupported MMS Extension has been connected	Disconnect the MMS Extension
	MMS Extension is defective	Replace MMS Extension
	Measurement Server defective	Replace Measurement Server

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
INOP Message “MsmtSrv not Supp” is issued	Wrong Software Revision	Upgrade monitor and/or measurement server to a matching software version.
	Too many measurement servers connected	Disconnect unsupported measurement servers for proper operation.
	Unsupported type of measurement server (for example M3000A on a M800xA monitor) connected.	Disconnect the unsupported measurement server.
Prompt message “Measurement Server not supported, unplug device, switch monitor off/on” and INOP “Bad Measurement Server are issued	M3000A Measurement Server Revision A is plugged. This Measurement Server is not compatible with the IntelliVue patient monitors	Disconnect the measurement server and cycle power.

#### MSL-related problems

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
Measurement Server does not start up (no LEDs active), no INOP or prompt displayed	No Power	Check MSL cable and replace if necessary
		Check MSL connector board incl. internal cable to main board and replace if necessary
Measurement Server does not start but LEDs are normal	Communication lines in MSL cable or MSL connector broken	Check MSL cable and MSL connectors
	MSL connector board defective	Check MSL connector board incl. internal cable to main board and replace if necessary

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
<p>MSL Power High INOP is issued</p> <p>Note: if this condition persists for longer than 15 minutes, the INOP MSL Power Off will appear (see below)</p>	Attached devices drawing too much power from the monitor.	
MSL Power Off INOP is issued	Attached devices drawing too much power from the monitor.	<p>Disconnect all MMS from the monitor</p> <p>Cycle power to restore power to the MSL devices.</p> <p>If the message disappears, reconnect MMS, waiting 15 minutes to see if message reoccurs. If yes, the respective MMS is faulty. See Multi-Measurement Module or Printer for troubleshooting tasks.</p> <p>Note: If an individual defective device is connected the MSL Power High or MSL Power Overload INOPs will appear initially. The MSL Power Off INOP will not occur for at least 15 minutes.</p>

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
MSL Power Overload INOP is issued	Short Circuit within MSL system	Disconnect MSL connection . If message persists, replace main board.
INOP BAD SERVER LINK is issued	Unexpected data detected on MSL	Check cable and power cycle the monitor
	An MMS with an incompatible software revision is connected to the monitor.	Connect MMS with compatible software revision
	Communication between the components not functioning	Check software versions and model number of devices for compatibility
INOP Message SERVERLINK MALF is displayed, audible indicator: a beep every two seconds	The hardware for communicating with the Multi-Measurement Server is faulty.	Check MSL cable, replace if necessary.
		Check MMS connector board. Replace if necessary.
A measurement supported by a server does not come up on the monitor	Label conflict	A parameter label from this measurement is already in use in the monitor. Check the conflict window to select the measurement.
The ECG Out/ Marker In function does not function	Hardware problem	Check MSL cable
		Check the MSL connector in the measurement server
	MSL connector board defective	Check MSL connector board incl. internal cable to main board and replace if necessary
	ECG Out / Marker IN on main board defective	Replace main board

## Alarm Issues

### Alarm Lamps

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
INOP Message Check Alarm Lamps is issued	Main board defective	replace Main board
Alarm occurs, but no LED lights up	Environmental lighting too bright	Place monitor in a darker environment
	Main Board defective	Main board

### Alarm Tones

Symptoms	Possible Causes of Failure	Failure Isolation and Remedy
INOP Message SPEAKER MALFUNCTION is displayed	Speaker cable disconnected	Reconnect speaker cable
	Speaker defective	Replace speaker
	Sound amplifier on main board defective	Replace main board
Alarm occurs but no alarm sound is issued	Audible alarm indicators have been switched off	Switch audible alarm indicators back on
	Volume set to 0	Increase volume
	Speaker defective	Replace speaker
	Sound amplifier on main board defective	Replace main board

### Alarm Behavior

If your monitor did not alarm in the way in which the end user expected, please consult the Instructions for Use for possible setup issues or configuration settings which could affect alarm behavior.



## Individual Parameter INOPS

If any of the following parameter INOP messages are issued try the respective parameter in another device. If the INOP message persists replace the parameter module, the MMS or other indicated device.

- CO2 EQUIP MALF
- ECG EQUIP MALF
- NBP EQUIP MALF
- <Pressure Label> EQUIP MALF
- RESP EQUIP MALF
- SpO<sub>2</sub> EQUIP MALF
- SpO<sub>2</sub> TRANSDUC MALF
- <Temp Label> EQUIP MALF

## Printer

Symptoms	Cause of Failure	Failure Isolation and Remedy
Prompt message "Print job could not be queued" is issued. No print device is found.	Printer is disabled in the Setup Printers menu  Paper size of printer does not match paper size of report	Enable the correct printer in the Setup Printers menu  Change paper size of the printer in the Setup Printers menu or change paper size of the report in the Setup Reports menu.
Status message "Print device Local 1 (Local 2) unavailable" is issued. Printer job is stalled.	Printer not switched on Printer paper tray empty Cabling not connected correctly PS/2 or USB I/O board defective	Switch on printer power fill printer paper tray Check cabling  replace I/O board
Status message "Print device Remote 1 (Remote 2, Remote 3) unavailable" is issued. Printer job is stalled	Print error on Philips Information Center  Network Connection to Philips Information Center not functioning	Print a test report on the Philips Information center. If this fails, refer to Philips Information Center documentation  Check that the network connection between the monitor and the Philips Information Center is working

Symptoms	Cause of Failure	Failure Isolation and Remedy
Status message “Printing on device Remote 1... (Remote 2, Remote 3)” is issued but no report is printed	Print queue on Philips Information Center is full. Reasons for this may be: - Printer is not switched on - Printer paper tray is empty	Switch on printer power Fill printer paper tray
Printouts are not as expected	Printer paper size is not correctly configured  Printer resolution is not correctly configured  Printer color support is configured to “On” although the printer does not support color  Printer not compatible	Configure the paper size according to the inserted print media  Configure the printer resolution according to the printer capabilities  Configure the printer color support to “Off”  Check specifications

## Recorder

Symptom	Possible Cause	Corrective Action
Monitor thinks that door is open when it is not.	Defective door switch.	Replace door switch. Exchange recorder.
Monitor thinks that the recorder is out of paper when it is not.	Paper-out sensor dirty.	Clean paper-out sensor.
Recorder not communicating with System.	Monitor not configured properly.	Check the configuration of the connected monitor.
Poor print quality.	Printhead dirty.	Clean the Printhead.
	Printhead failure.	Exchange the recorder.
	Paper not inserted correctly	Check that paper is inserted correctly
Paper not feeding properly.	Paper roll off center.	Center paper roll on roller guides.
	Dirty roller.	Clean roller.

**MIB / RS232**

Symptoms	Cause of Failure	Failure Isolation and Remedy
AGM connected to an RS232 port not functioning	The MIB/RS232 port is not configured for AGM	Check configuration of the MIB/RS232 ports in configuration mode
	The cable between AGM and monitor is not connected correctly or defective	Check cable connection, replace cable if necessary
	The MIB/RS232 board is in a wrong slot (slot has been changed after software configuration or an additional board has been plugged in)	Verify correct placement of the I/O boards
	The MIB/RS232 board is defective	Check board and replace if necessary

Symptoms	Cause of Failure	Failure Isolation and Remedy
External device not receiving data	The MIB/RS232 port is not configured for data export	Check configuration of the MIB/RS232 ports in configuration mode
	The wrong data export protocol driver is configured in the monitor	Check the export protocol required by the attached device and configure the monitor accordingly
	The cable between the external device and the monitor is not connected correctly or defective	Check cable and replace if necessary
	The external device does not support the version of the data export protocol used in the monitor	Check if the device supports the version of the data export protocol. Upgrade device or monitor if necessary (if matching versions exist).
	A terminal concentrator is used in between the device and the monitor and a protocol with dynamic speed negotiation is used	Some terminal concentrators do not support changing the transmission speed (baud rate) dynamically. Check if the connection works without the concentrator
	The MIB/RS232 board is in a wrong slot (slot has been changed after software configuration or an additional board has been plugged in)	Verify correct placement of the I/O boards
	The MIB/RS232 board is defective	Check board and replace if necessary
Detailed Protocol Problem		Consult the Data Export Protocol document.

**USB**

Symptoms	Cause of Failure	Failure Isolation and Remedy
One LED next to a port with a connected USB device is off	The device connected to the port with the switched off LED is not supported.	Unplug the unsupported device.
	A printer connected to the port is not switched on	Switch on the printer.
	Short-Circuit	Unplug the device in the respective port and try again.
All LEDs on the USB board are off, even though devices are connected	The connected devices are drawing too much electricity.	Unplug the connected devices one by one until the LEDs come back on.
	Unsupported combination of devices.	Unplug the connected devices one by one until the LEDs come back on. See <b>Connection of USB Devices</b> (on page 250) for details on supported combinations.
None of the connected devices are functioning.	Connected devices or USB board defective.	Unplug all devices and reboot the monitor. The LEDs on the USB board should switch on briefly and then turn off. If they remain on, the USB board is defective and needs to be exchanged.

**Flexible Nurse Call Relay**

Symptoms	Cause of Failure	Failure Isolation and Remedy
INOP message CHECK NURSE CALL RELAY is issued	Nurse Call Relay board defective	Replace Nurse Call Relay I/O board.

Symptoms	Cause of Failure	Failure Isolation and Remedy
Monitor alarmed, Nurse Call did not activate	Incorrect configuration (Relay latency, Relay trigger)	Check monitor configuration (see configuration guide)
	Connection of cable to monitor or nurse call system not correct	Check cable connections
	Nurse Call Relay board is in the wrong slot.	Verify correct placement of the I/O boards
	The Nurse Call Relay board is defective	Replace Nurse Call Relay board

### Basic Nurse Call Relay

Symptoms	Cause of Failure	Failure Isolation and Remedy
Monitor alarmed, Nurse Call did not activate	Incorrect configuration (Relay latency, Relay trigger)	Check monitor configuration (see configuration guide)
	Connection of cable to monitor or nurse call system not correct	Check cable connections
	The system interface board is defective	Replace system interface board

### Troubleshooting the ECG OUT

Symptoms	Cause of Failure	Failure Isolation and Remedy
No ECG-OUT signal to the Defib		Disconnect the MMS and Defib cable.  Connect Known good Defib, Defib cable MMS and MMS cable. Check Marker pulse and ECG OUT signal at defib again. <b>If there is still no signal:</b>
	Main Board defective	Replace main board
No marker pulse is displayed on the monitor	Defib does not send marker	Check whether defib is able to send marker or check for internal electronic defects.

## Docking Station Problems

### NOTE

Before checking for further problems, make sure that the monitor is properly and firmly inserted into the docking station (indicated by a click).

Symptoms	Cause of Failure	Failure Isolation and Remedy
AC LED on Docking Station does not light up	AC connection not ok	Check that the AC-Mains are powered and the power cord is properly connected.
	Docking Station or Docking System Interface board defective	Exchange the docking system interface board or the docking station.
AC LED on Docking Station lights up but AC LED on monitor does not.	Monitor not docked correctly	Check whether the lever is in the right-hand position.
		Check if the monitor AC LED lights up when the monitor is connected directly to AC mains. If yes;
	Docking Station defective	Exchange Docking Station
Monitor cannot be properly docked to the docking station	Docking interface board not correctly installed in the monitor	Make sure that docking interface board is installed in the monitor

Symptoms	Cause of Failure	Failure Isolation and Remedy
Monitor in docking station has AC Power but network connection could not be established	Docking interface board not installed in monitor	Make sure that docking interface board is installed in the monitor
	LAN cable not connected or defective	Check the LAN cable connection. Try the LAN cable directly in the monitor. If it functions in the monitor but not in the docking station, see other possible causes below. If it doesn't function in the monitor, exchange the LAN cable
	Flex cable in docking station not connected properly or defective	Check the flex cable connection in the docking station. Exchange flex cable if necessary.
	Docking Station main board defective	Exchange docking station main board
	Other network related problems.	See Network related problems
Monitor does not boot or constantly reboots but functions properly outside docking station	Flex cable in docking station not connected properly or defective	Check the flex cable connection in the docking station. Exchange flex cable if necessary.
	Docking Connector soiled or blocked.	Make sure there is no dirt or other foreign bodies in the docking connectors
	Docking Station main board defective	Exchange docking station main board

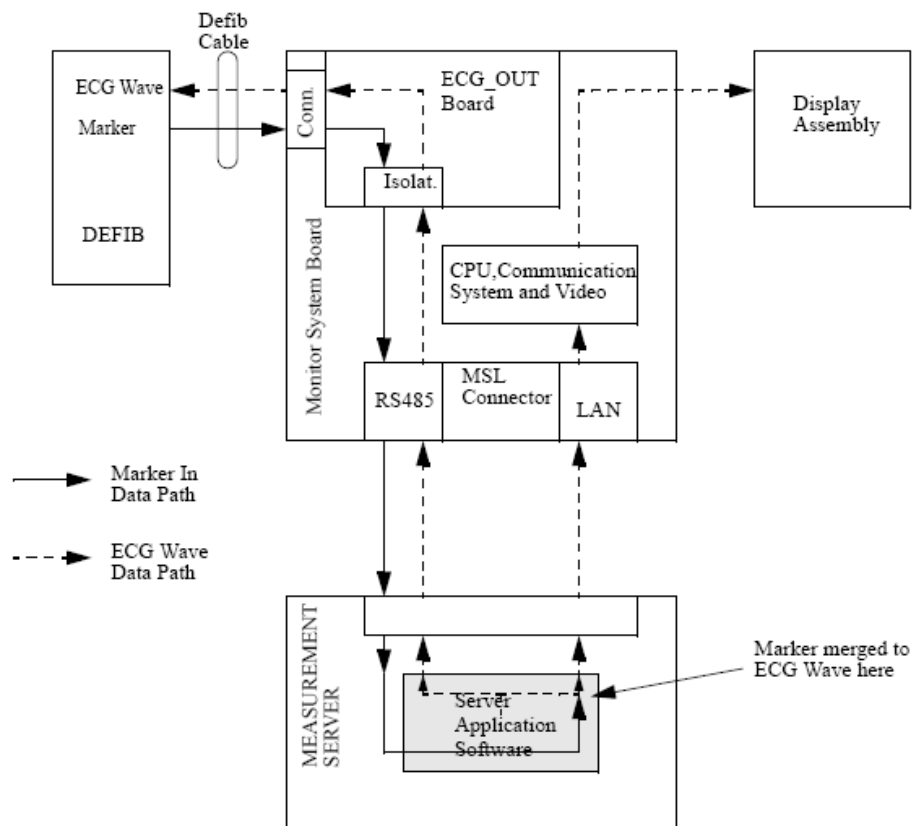
### Image Sticking

If a static image is displayed for a long time on an LCD display, image sticking, i.e. a temporarily retained image, may occur. To eliminate image sticking, switch off the display and switch it back on again. It is also recommended to use the moving image in standby mode.



## Data Flow Marker In and ECG Wave

The following illustration of the data flow for Marker In and ECG Wave may assist in troubleshooting.



## Status Log

Many events that occur during start-up or regular monitoring are logged in the Status Log. The Status Log can be printed and cleared. Not all entries in the Status Log are errors.

Monitor				
H	1720	20050	1	4 Apr 02 16:37
C	1721	21050	1	4 Apr 02 15:37

The window title is either **Monitor** or **MeasServ**, dependent on which system component's status log is currently displayed.

The Status Log window shows logged events which caused a reboot of the system component (monitor or measurement server).

To enter the Status Log Window, select Main Setup -> Revision. The following list opens up:

- **Status Log**
- **Product**
- **Appl. SW**
- **Config**
- **Boot**
- **Language**

Select **Status Log**.

The first column in the log identifies the event class ("C": caused a cold start, "H": caused a hot start, "N": no restart, for information only). Column 3 and 4 identify the event source and event code. Column 4 counts the number of occurrences of the event. The last column shows the time and date of the last occurrence of the event.

The following pop-up keys overlay the SmartKeys:

<b>Clear StatLog</b>			<b>M8001</b>	<b>M3001</b>
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**Clear StatLog**

This key clears the currently displayed Status Log

**M8001 or M8002**

This key switches to the Monitor Revision Window

**M3001**

#### NOTE

This key switches to the Multi Measurement Server (MMS) Revision Window

If an event occurs repeatedly, contact your Philips Service Representative.

#### NOTE

It is possible, using the support tool, to download the status log and send it to your Philips Service Representative as a file (for example via e-mail).

## List of Error Codes

There are no error codes at this point.

## Troubleshooting with the Support Tool

Using the support tool you can:

- access the full status log which can be saved as a file
- reload software
- identify defective devices
- reset touch screen calibration

For details on how to perform these tasks see the Support Tool User Manual.

## Troubleshooting the Individual Measurements or Applications

For problems isolated to an individual parameter or application, please consult the Instructions for Use and configuration information.

If the instructions for use did not resolve an individual parameter problem, then another measurement server should be tried.

If you are getting questionable readings for individual measurements you may want to do the Performance Verification tests in the *Testing and Maintenance* section.

The performance of the individual applications (arrhythmia, trending) are affected by the configuration of the monitor. When contacting Philips support you may be asked about the configuration of the monitor to aid in troubleshooting.



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# Repair and Disassembly

The following section describes the disassembly and reassembly procedures for the monitor and its components to the extent required to remove and replace faulty assemblies. Do not further disassemble the product past the point described in these procedures.

---

## WARNING

High Voltage - Voltages dangerous to life are present in the instrument. Do not perform any disassembly or reassembly procedures (other than MMS, MMS extension or parameter module removal) with power applied to the instrument. Failure to adhere to this warning could cause serious injury or death.

---

Before doing any disassembly, turn power off, disconnect the Local Distribution Cable, **AC power cable**, MSL cable, Defib sync' cable and RS232 cable (where appropriate), disconnect the MMS and remove **batteries**.

## Tools required

- Torx screwdrivers (sizes 8, 10, 20)
- 4 mm Allen Wrench
- Small flat head screwdriver
- Socket Wrench
- 5.0 Hexagon Socket
- M6 Screw Wrench
- SPH size 1 cross-tipped Screwdriver
- Needle Nose Pliers
- ESD mat and wrist strap
- Cleaning Agent

Recommended cleaning agents are:

Tensides (dishwasher detergents)	Edisonite Schnellreiniger <sup>â</sup> , Alconox <sup>â</sup>
Ammonias	Dilution of Ammonia <3%, Window cleaner
Alcohol	Ethanol 70%, Isopropanol 70%, Window cleaner

## How to find the Correct Procedure

The following disassembly procedures are described:

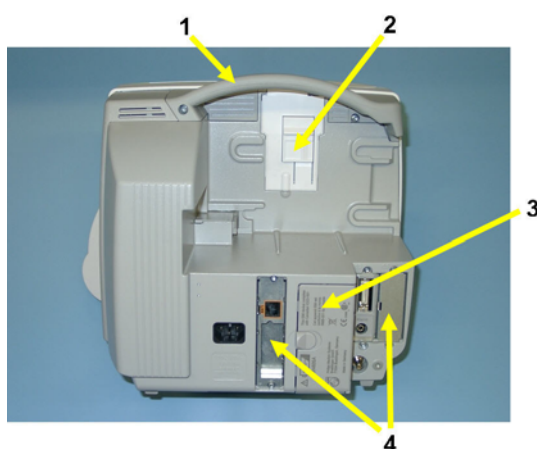
- 1.1 Removing the Handle
- 1.2 Removing Measurement Server Holder
- 1.3 Removing the I/O Boards and Interface Board
- 1.4 Removing the Recorder
- 1.5 Removing the Navigation Point Knob
- 1.6 Removing the Quick Release Mount and Knob
- 2.0 Opening the Front of the Monitor
- 2.1 Removing the Backlight Tubes
- 2.2 Removing the Backlight Inverter Board
- 2.3 Removing Power On LED board and Silicon Pad
- 2.4 Removing the HIF Board, Silicon Pad and Spacer
- 2.5 Removing the Flex Adapter Cable
- 2.6 Removing the Battery Board
- 2.7 Removing Recorder Board Assembly
- 2.8 Removing the Loudspeaker
- 2.9 Removing the Branding Cover
- 3.0 Separating the Front and Back Half of the Monitor
- 3.1 Removing the LCD Flat Panel Display, Touch Panel and Front Housing
- 3.2 Removing the Main Board
- 3.3 Removing the MSL Assembly
- 3.4 Removing the Power Supply
- 3.5 Removing the Bezel and Serial Number Plate

At the beginning of each procedure there is a list of any other steps which must be completed before starting this procedure.

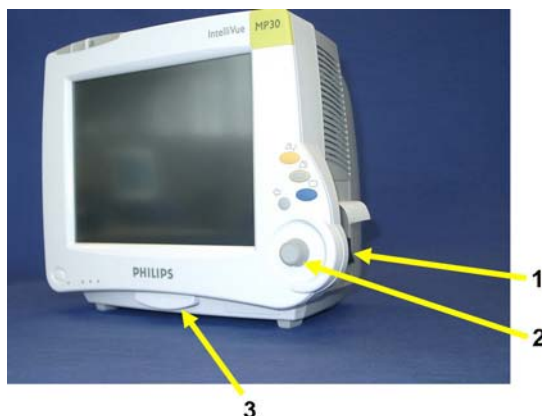
# Removing Directly Accessible Parts

Several replaceable parts are accessible before the monitor is disassembled. These are:

- Handle
- Measurement Server holder (picco snap assembly)
- I/O boards and interface board
- Recorder
- NavigationPoint knob
- Quick release mount
- Quick release mount - release knob



No.	Description
1	Handle
2	MMS Holder
3	Battery Door
4	System Interface Board and I/O Boards



No.	Description
1	Recorder
2	Navigation Point Knob
3	Quick Release Mount Knob

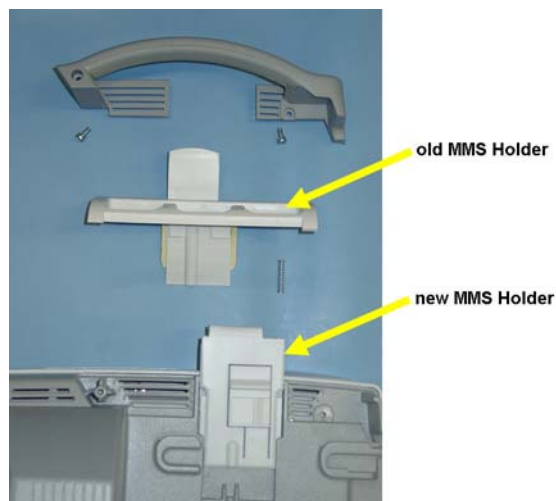
### 1.1 Removing the Handle



1. Remove the two screws securing the handle.
2. The handle can be removed

### 1.2 Removing the Measurement Server Holder

#### Removing the old MMS Holder



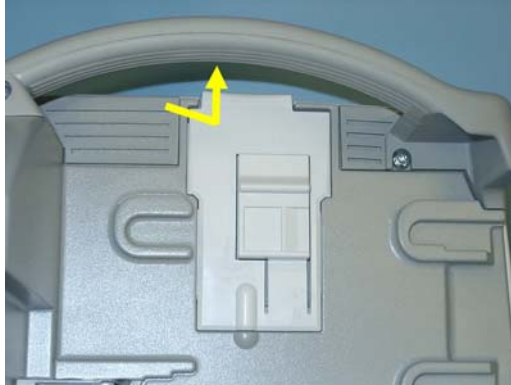
1. First remove the handle as described above.
2. Pull the holder away from the monitor and upwards to remove.
3. Insert the new measurement server holder



**Removing the new MMS Holder****NOTE**

The handle does not need to be removed for this procedure

1. Pull the MMS holder forward and then up.

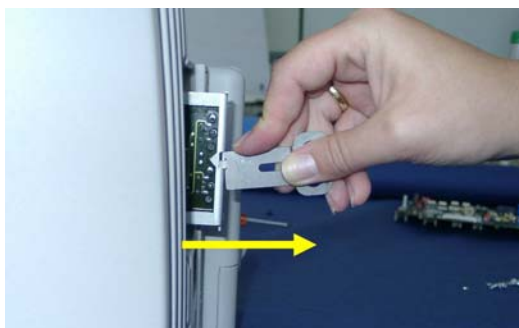
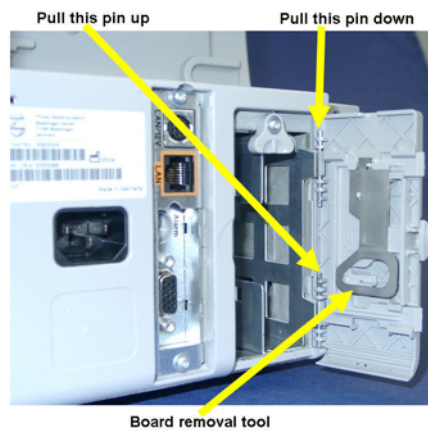


### 1.3 Removing the I/O Boards and Interface Board

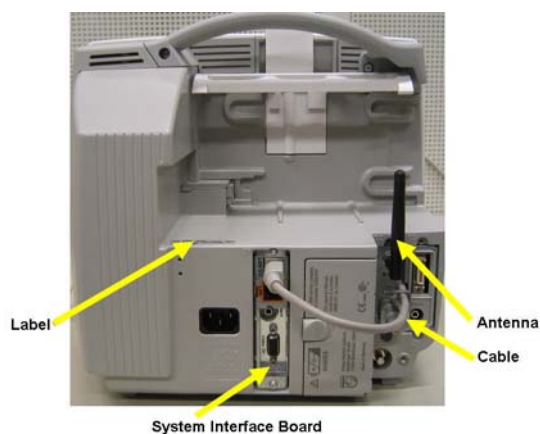
1. Remove the two screws securing each I/O board and the interface board and then remove the boards using the board removal tool located in the battery compartment.



For door removal:



**Reassembly Note:** If you have installed #J35 (-USR\_ProductName- 802.11 Bedside Adapter) please attach the approval label or the WLAN Label for Japan (country specific) and the antenna and plug in the cable as shown below.

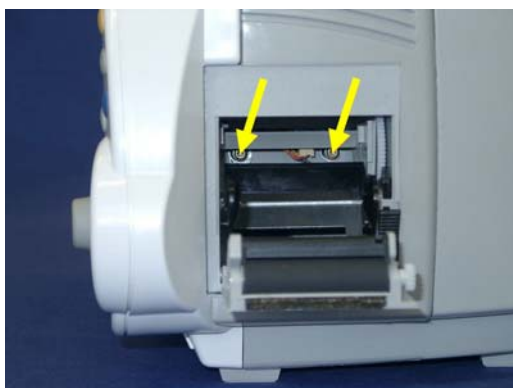


#### NOTE

The installation of #J35 requires a system interface board with wireless functionality.

### 1.4 Removing the Recorder

1. Press on the door release lever to open the recorder door.
2. Remove the paper roll.
3. Remove the two screws securing the recorder and pull the recorder out.



### 1.5 Removing the Navigation Point Knob

The NavigationPoint knob can be removed by hand. Pull the knob forwards, away from the monitor.

### 1.6 Removing the Quick Release Mount and Knob

1. Press the knob down and release the lock with a small screwdriver. You can now pull out the knob.



2. Remove the two Allen screws securing the quick mount and pull the mount out of the recess in the monitor.

### 1.7 Removing the Fix Mount

1. Remove the two screws securing the fix mount.



2. Pull out the fix mount



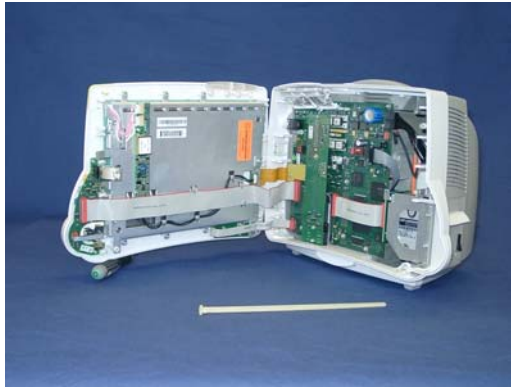
## 2.0 Opening the Front of the Monitor

When the front of the monitor is opened the following replaceable parts are accessible:

- Backlight inverter PCA
  - Backlight tubes
  - Battery board
  - Recorder board assembly
  - Power on LED board
  - HIF board
  - Loudspeaker
  - LCD flat panel display
  - Main board
  - MSL assembly
  - Power supply
  - Branding cover
  - Serial number plate
1. Turn the two plastic screw pins 180 degrees counterclockwise and pull them out. Use a small screwdriver to pull the screw head out of the recess in the housing.



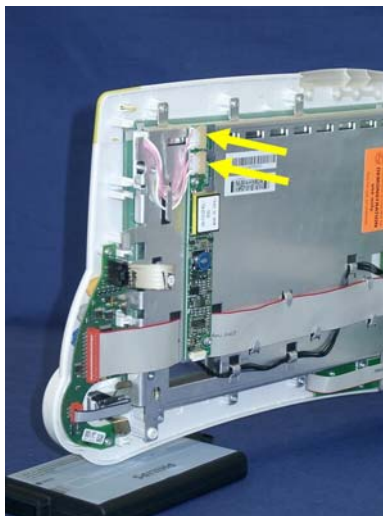
2. The hinges allow the monitor to be opened like a book. Support the display before proceeding further.



## 2.1 Removing the Backlight Tubes

Previous steps: 2.0 Opening the front of the monitor

1. Unplug the two upper cables from the backlight inverter board.



2. Slide out the backlight tubes.



**NOTE**

At reassembly make sure that the cables are laid through the slit and under the cable retention tab.

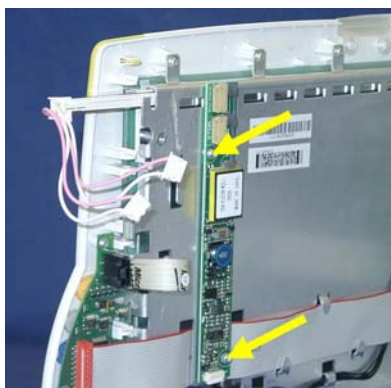
**2.2 Removing the Backlight Inverter Board**

Previous steps: 2.0 Opening the front of the monitor, 2.1 Removing the backlight tubes - Step 1

1. Unplug the backlight inverter board cable. This cable can be removed for exchange by also unplugging it from the socket at the flex adapter cable.



2. Remove the two screws securing the board, and remove the board.





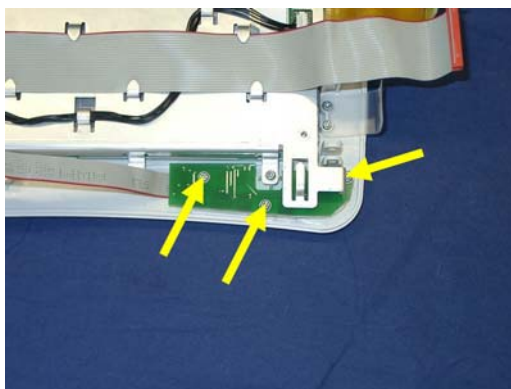
### 2.3 Removing Power On LED board and Silicon Pad

Previous steps: 2.0 Opening the front of the monitor

1. Unplug the power on LED board cable from the main board.



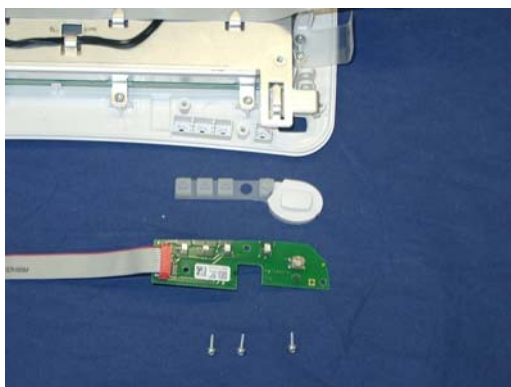
2. Remove the three screws securing the power on LED board.



#### NOTE

Photos 2 and 3 show the front and back halves of the monitor separated, this is however **not necessary** at this stage of disassembly.

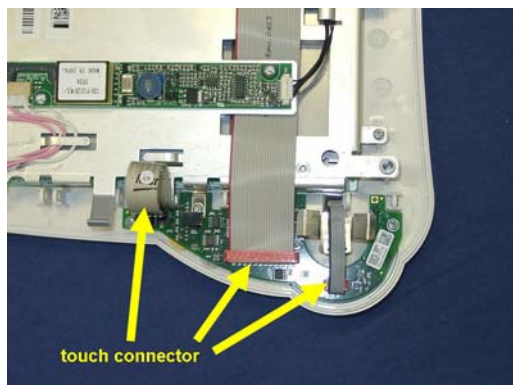
3. Remove the board and the silicon pad.



## 2.4 Removing the HIF Board, Silicon Pad and Spacer

Previous steps: 2.0 Opening the front of the monitor

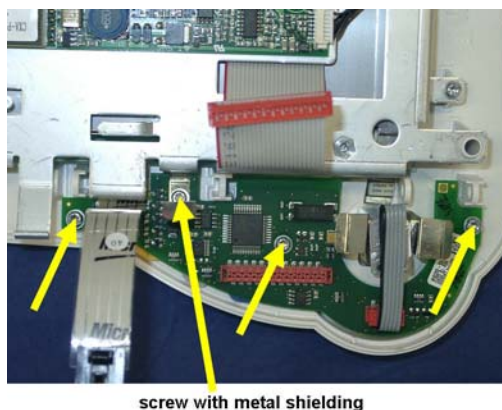
1. Unplug the two connectors (three on the touch version). For HIF cable replacement unplug the cable also on the main board.



### NOTE

At reassembly feed the **lower** section of the touch cable through the retainer tab on the metal chassis. Make sure that the cable is not kinked.

2. Remove the four screws securing the board. Note the position of the metal shielding associated with one of the screws in order to replace it correctly during reassembly.



3. You can now remove the board, the silicon pad, and the plastic spacer.



4. To remove the encoder (the part exposed when the navigation point knob has been removed) use needle-nosed pliers to unscrew the split nut so that the encoder can be removed from the inside.

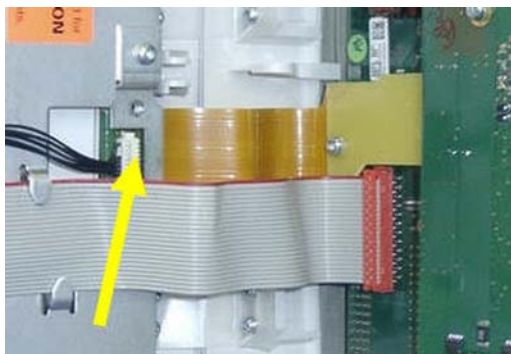
**NOTE**

Note the position of the metal shielding on the rear side of the encoder in order to position it correctly at reassembly.

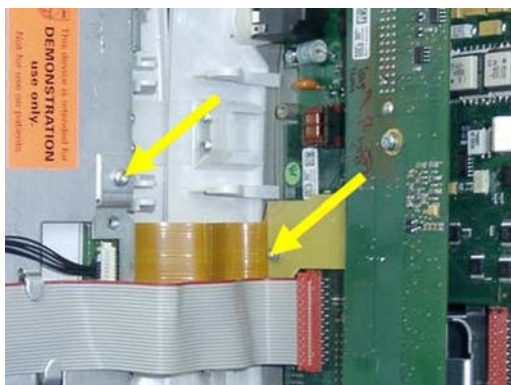
**2.5 Removing the Flex Adapter Cable**

Previous steps: 2.0 Opening the front of the monitor

1. Unplug the backlight inverter board cable.



2. Remove the two screws securing the flex adapter cable and unplug it from the mother board and the display chassis.



**NOTE**

At reassembly make sure that the EMC pads are still in position before replacing the screws.

**2.6 Removing the Battery Board**

Previous steps: 2.0 Opening the front of the monitor

1. Remove the three screws securing the board.



2. Remove the board by pulling forwards to unplug the connector on the rear.



**Reassembly Note:** When reinserting the battery board, make sure the connector is plugged tightly into the board in order to avoid any short circuit of the board with the metal chassis when the display is reassembled.

## 2.7 Removing Recorder Board Assembly

Previous steps: 2.0 Opening the front of the monitor

1. Unplug the recorder cable from the main board.



2. Remove the recorder as described on on page 1.
3. Remove the 2 screws securing the metal recorder housing and pull out the housing with board and cable.

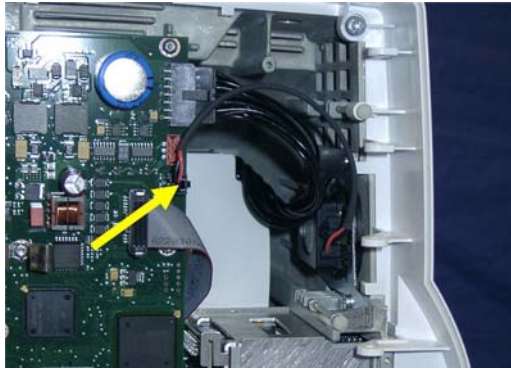




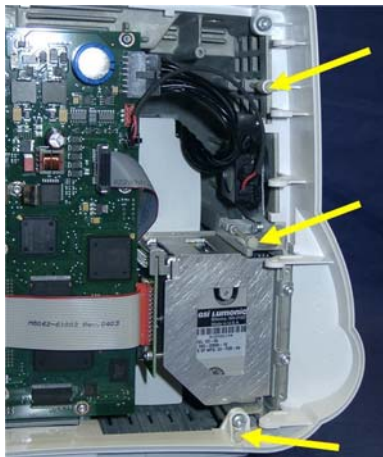
## 2.8 Removing the Loudspeaker

Previous steps: 2.0 Opening the front of the monitor

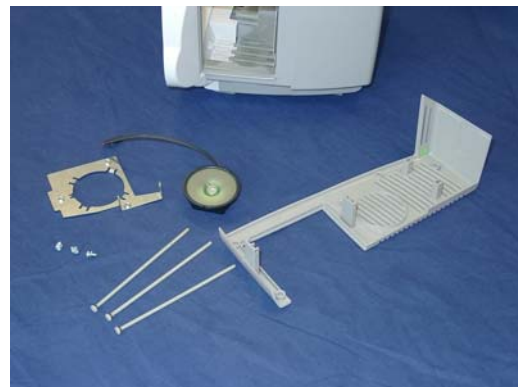
1. Unplug the loudspeaker cable from the main board.



2. Remove the three plastic pins securing the side cover and remove the cover.



3. Remove the three screws securing the loudspeaker and remove the loudspeaker.



**NOTE**

At reassembly, position the loudspeaker on the mounting plate so that the hook on the loudspeaker fits in the groove on the mounting plate.

**2.9 Removing the Branding Cover**

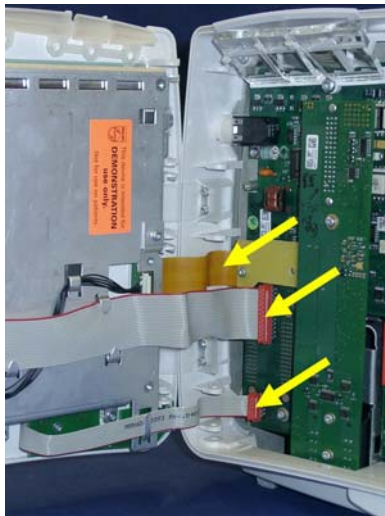
Previous steps: 2.0 Opening the front of the monitor

1. On the inside of the front housing, push together the clip holding the branding cover (with the help of a screwdriver, if necessary) to release the cover.

**3.0 Separating the Front and Back Half of the Monitor**

Before all further disassembly steps it is necessary to separate the front part of the monitor from the main housing.

1. Disconnect the three cables connecting the front and back halves of the monitor.



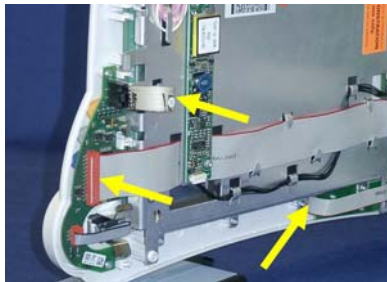
2. Unscrew the four screws securing the hinges to the back half of the monitor.



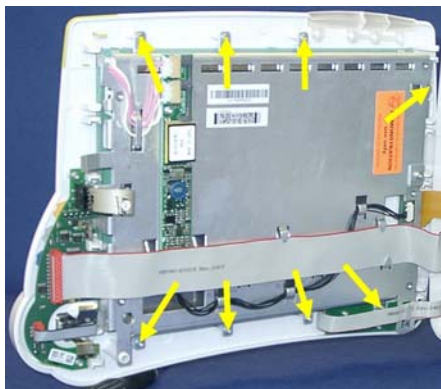
### 3.1 Removing the LCD Flat Panel Display, Touch Panel and Front Housing

Previous steps: 2.0 Opening the front of the monitor, 3.0 Separating the front and back half of the monitor

1. Unplug the HIF cable and the touch cable from the HIF board. Remove the power on LED cable from its retainer to gain access to the mounting screw.

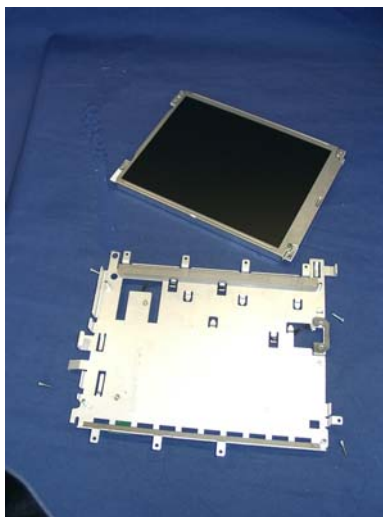
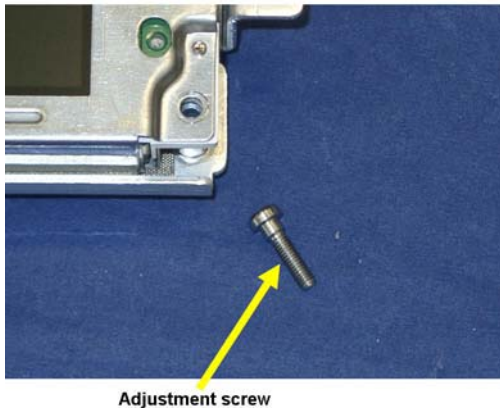
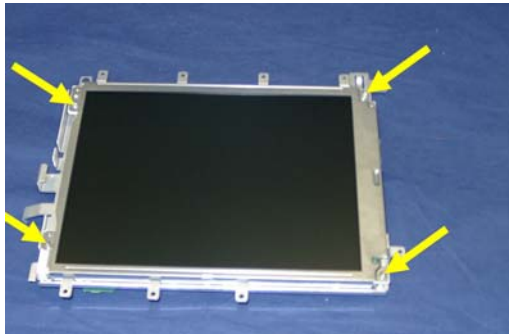


2. Remove the eight screws securing the display assembly on the front panel.



3. Unplug the backlight inverter board cable, the backlight tubes cables and the LCD cable.
4. Remove the four screws securing the display to the metal chassis. The two lower screws are special adjustment screws and must be replaced in the correct positions.



**NOTE**

At reassembly, replace the two adjustment screws first, followed by the two upper screws.

5. Remove the HIF board and Power on LED board (procedures 2.4 and 2.5) to obtain the front housing for replacement.

### 3.2 Removing the Main Board

---

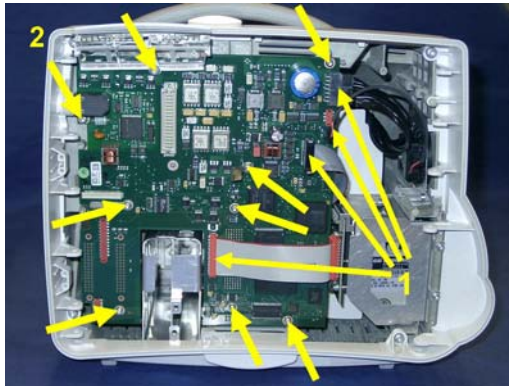
**CAUTION**

All I/O boards and interface boards must be removed before removing the main board .

---

Previous steps: 1.3 Removing the I/O boards and Interface board, 2.0 Opening the front of the monitor, 3.0 Separating the front and back half of the monitor

1. Unplug the power supply cable, the loudspeaker cable, the MSL cable and the recorder cable from the main board.
2. Remove the screw securing the lightpipe assembly and remove the assembly.
3. Remove the eight screws securing the main board.

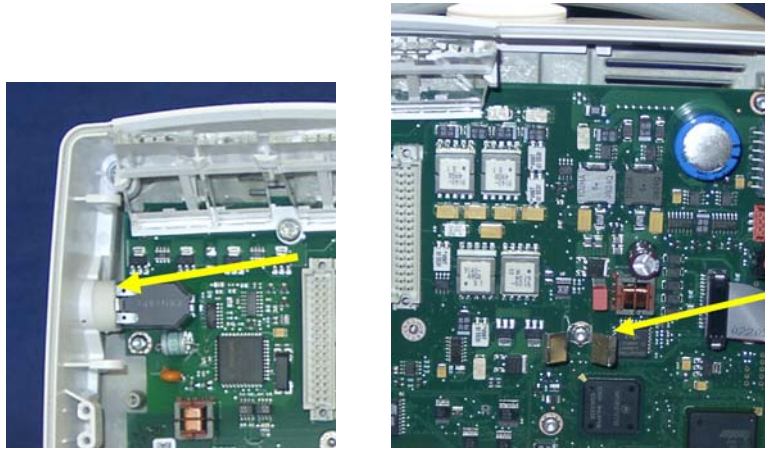


4. Lift the right side of the main board up and pull out to the right.



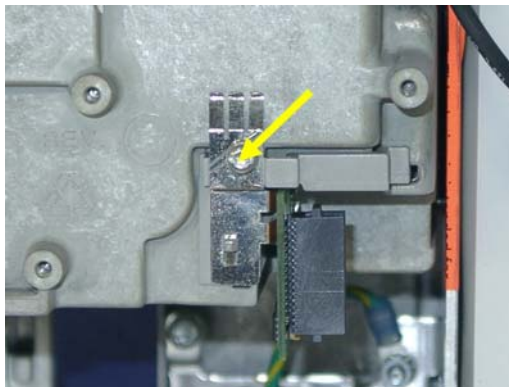
**NOTE**

When replacing the main board, make sure that the white seal on the left (ECG-out connector) is positioned to seal well. Ensure also that the screw with the metal shielding is replaced in the correct position, and with the metal “wings” oriented horizontally.

**3.3 Removing the MSL Assembly**

Previous steps: 2.0 Opening the front of the monitor, 3.0 Separating the front and back half of the monitor, 3.2 Removing the main board

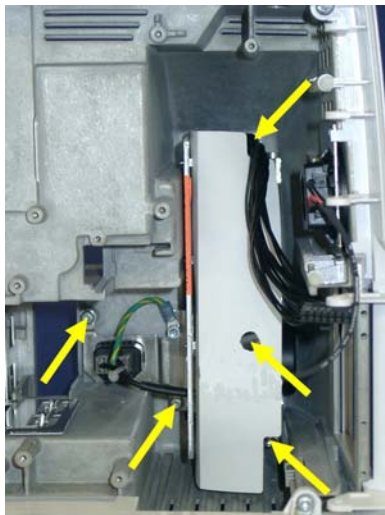
1. Remove the screw securing the assembly.



### 3.4 Removing the Power Supply

Previous steps: 2.0 Opening the front of the monitor, 3.0 Separating the front and back half of the monitor, 3.2 Removing the main board

1. Remove the five screws securing the power supply - one must be unscrewed through the hole in the white protective cover.



2. Pull the power supply out of the monitor.

### 3.5 Removing the Frame Housing and Serial Number Plate

Previous steps: 2.0 Opening the front of the monitor, 3.0 Separating the front and back half of the monitor,

1. Remove the four screws and two pins which secure the frame housing to the rear housing.



2. Remove the serial number plate by pushing together the two retention clips on the inside of the frame housing.

# Multi-Measurement Module (MMS) Disassembly

Please follow the disassembly and reassembly steps below closely. Do not disassemble the MMS past the point described in the procedures below.

## Tools required

- thin-bladed screwdriver
- ESD mat and wrist strap

---

## WARNING

- Do not open the MMS while it is connected to a monitor.
  - Parts inside the instrument may be contaminated with bacteria. Protect yourself from possible infection by wearing examination gloves during this procedure.
- 

## Removing the Front Cover

1. Position the thin-bladed screwdriver in the small slot provided for this purpose. Remove the front cover by pulling it away from the MMS until it snaps off. There may be a slight resistance when removing the front cover.



## Removing the Mounting Pin

1. Position the MMS with the connectors facing towards you. There are four long mounting pins threaded into the MMS in each of the four corners under the cover. Locate the heads of the two long mounting pins on the top cover and only remove these.

2. Use the thin-bladed screwdriver to lift the pins gently out, far enough that they can be removed manually.



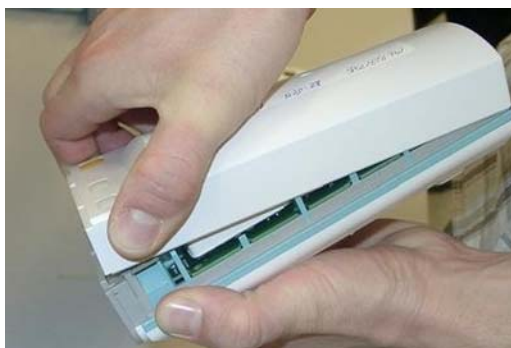
3. Remove the two pins and set them aside for refitting.

**NOTE**

Without these long mounting pins, the MMS will not function properly

**Removing the Top Cover**

Begin by gently pulling the top cover away from the MMS. The top cover is press-latched at the MMS connector. There might be a resistance due to the rubber sealing. Remove the cover slowly, without hitting or touching the inside of the MMS.





## Removing the DC/DC Board

### NOTE

The HW Rev C MMS (S/N prefix DE610xxxxx) does not have a separate DC/DC board anymore.

The DC/DC board is connected to the main board. Loosen the pin connection to the main board and remove the DC/DC board by gently lifting it up. Avoid touching the surface of the board. Set it aside where it is ESD protected.

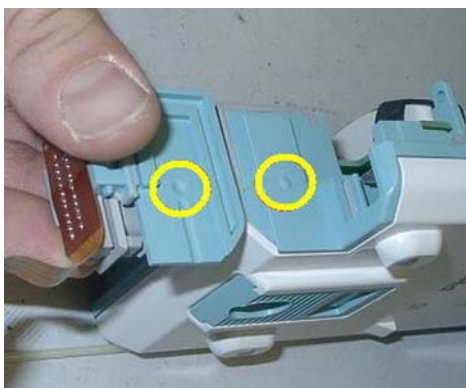


## Removing the MSL Flex Assembly

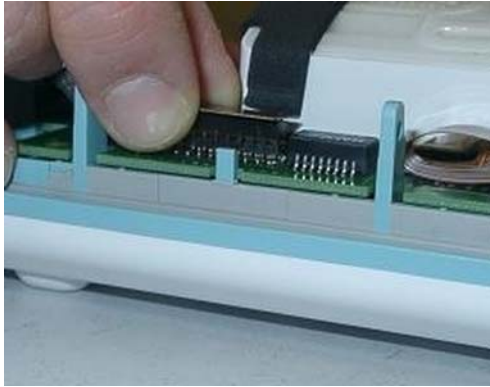
1. After the DC/DC board is removed, lift up the MSL frame connector to which the MSL Flex is attached.



At the beginning there might be resistance due to the special fixing mechanism shown in the picture below.

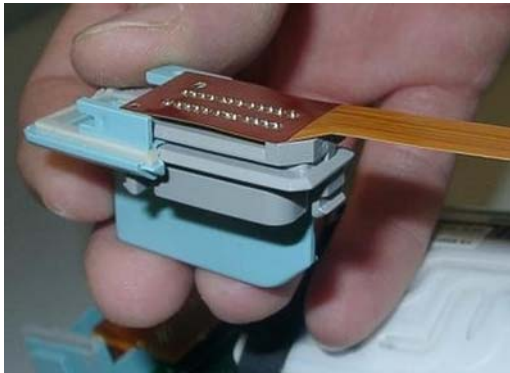


2. Lift up the flex connector carefully. Do not bend the connector pins on the main board.



### Reassembling the MSL Flex Assembly

1. Insert the MSL Flex layer into the frame connector as shown below by moving it into the appropriate dove tail.

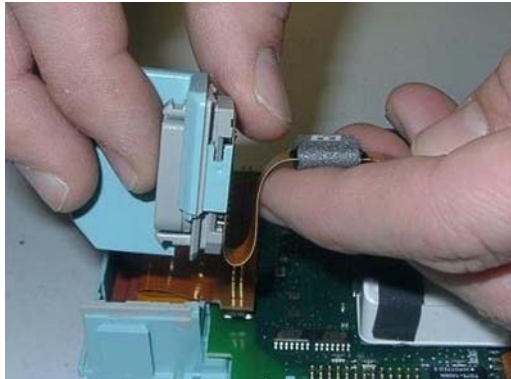


2. To insert the MSL Flex into the MMS, it has to be bent carefully. Bend the MSL Flex in a 180 degree angle as shown below. Do not crease the flex.

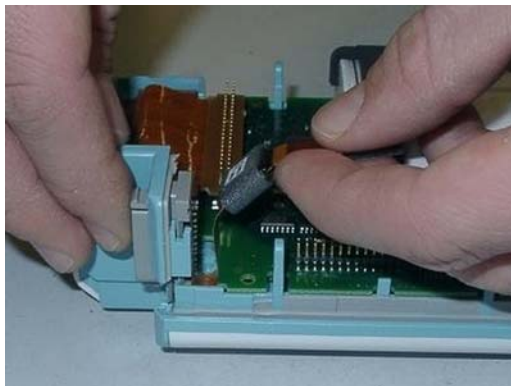




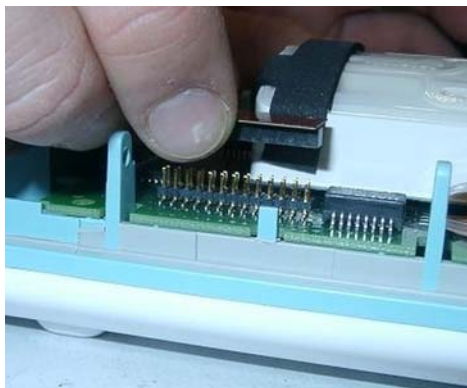
3. The second bend has to be done as shown below. To be able to connect the MSL flex to the main board afterwards, the flex has to be bent in a 90 degree angle as shown in the picture. Do not crease the flex.



4. Insert the frame connector with the attached and bent MSL Flex. Be careful not to damage the MSL flex when pushing the frame connector downwards.



5. Position the connector correctly and push it into place.

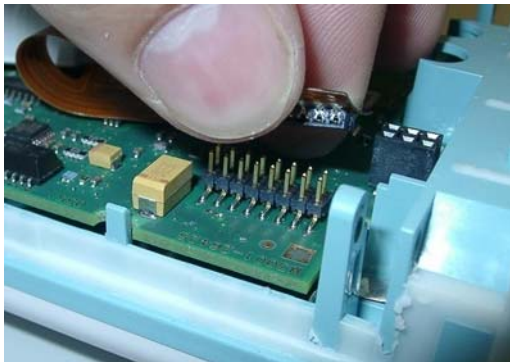


### Removing the NBP pump

1. Remove the pump by lifting it up. Set the pump aside. Also remove the old silicon tubes.

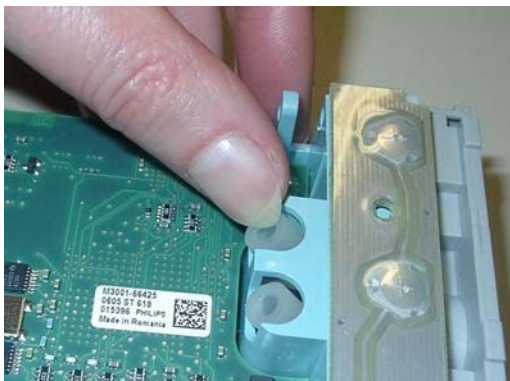


2. Remove the connector of the NBP pump assembly. The connector may sit tightly. Gently loosen the connector.



### Refitting the new NBP Pump

1. Insert new silicon tubes. Make sure they are seated correctly by pressing them into their position.



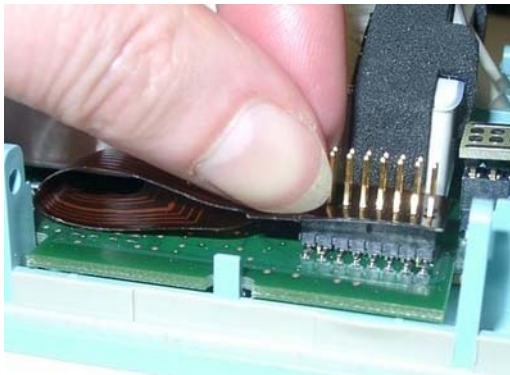
2. Insert the new pump assembly. Lift up the back and press the airways onto the silicon tubes.



3. Make sure the airways have a tight connection to the silicon tubes.



4. Insert the connector of the NBP assembly into the connector on the main board. Do not crease the flex cable. M3001A HW A/B and M3000A have a post connector with long pins. Press down the connector until there is no gap between the connectors.



## Refitting the DC/DC board

### NOTE

This step only has to be done on HW A/B

Position the DC/DC board and press it down gently. Make sure it is connected properly to both connectors indicated in the picture.



## Refitting the Cover

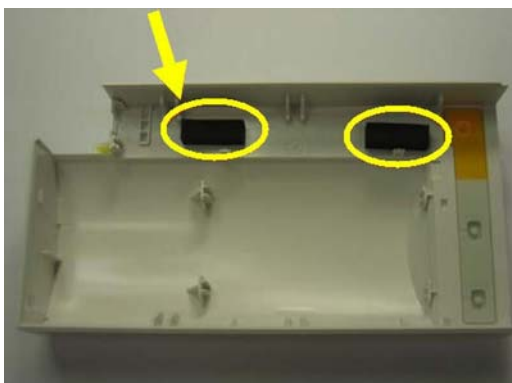
### NOTE

To change the top cover of a HW Rev C MMS (S/N prefix DE610xxxxx) you have to attach the two cushions which are part of the Top Cover Assembly. These two cushions secure the connection of the MSL Flex and the NBP Flex.

### NOTE

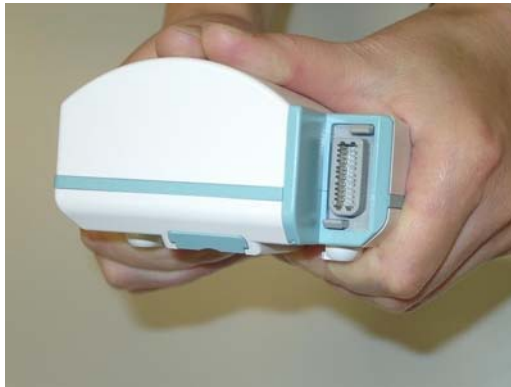
Perform the following two steps only on an MMS HW Rev C

1. Stick the two cushions onto the marked positions inside the top cover.



2. Position the top cover, then press it back into place until you hear a click or there is no longer a gap between the two covers.

3. The cover has a rubber seal, press the cover firmly together.



4. Holding the bottom cover firmly in place, slide the two long mounting pins completely back into the MMS. Make sure there is no gap between the top and bottom cover.



### Refitting the Front Cover

To refit the front cover, press it back into place over the measurement connector hardware until you hear a click.



## Final Inspection

Perform a final inspection to ensure that:

- The MSL connector is positioned correctly
- There are no gaps between the MSL connector and the cover
- there is no gap between the top and bottom cover

## Testing

To ensure that the MMS is functioning correctly, you must perform safety tests and a performance check on it. Please refer to the sections "Maintaining the Instrument" and "Testing the Instrument".

# MMS Extensions - Exchanging the Top Cover, MSL Flex Cable and the Dual Link Bar

This section describes the exchange procedures for:

- The Top Cover with new release mechanism
- The Dual Link Bar incl. the MSL Flex Cable.

for all MMS Extension (MSE) types (M3012A, M3014A, M3015A, M3016A).





## Exchange Procedures

### NOTE

Please follow the disassembly and reassembly steps closely.

### Tools Required:

A thin-bladed screwdriver and a thick-bladed screwdriver, ESD mat and wrist strap

---

### WARNING

- Do not open the MSE while it is connected to a monitor.
  - Parts inside the instrument may be contaminated with bacteria. Protect yourself from possible infection by wearing examination gloves during this procedure.
- 

### NOTE

Once you have reassembled the MSE, you must perform a performance check on it. Please refer to the sections "Maintaining the Instrument" and "Testing the Instrument" .

## Removing the Front Cover

1. Position the thin-bladed screwdriver in the small slot provided for this purpose. The front cover (Bezel) then clicks away from the Extension. Remove the front cover



### NOTE

There might be a slight resistance when you remove the front cover.



### Removing the Mounting Pin

1. Position the MSE on the dual link bar with the measurement connector hardware facing upwards and the arm of the dual link bar away from you. There are four long mounting pins threaded into the MSE in each of the four corners under the cover. Locate the heads of the two long mounting pins on the top housing and only remove these.
2. Use the thin-bladed screwdriver to lift the pins gently out far enough so they can be removed manually.



3. Remove the two pins and set them aside for refitting.



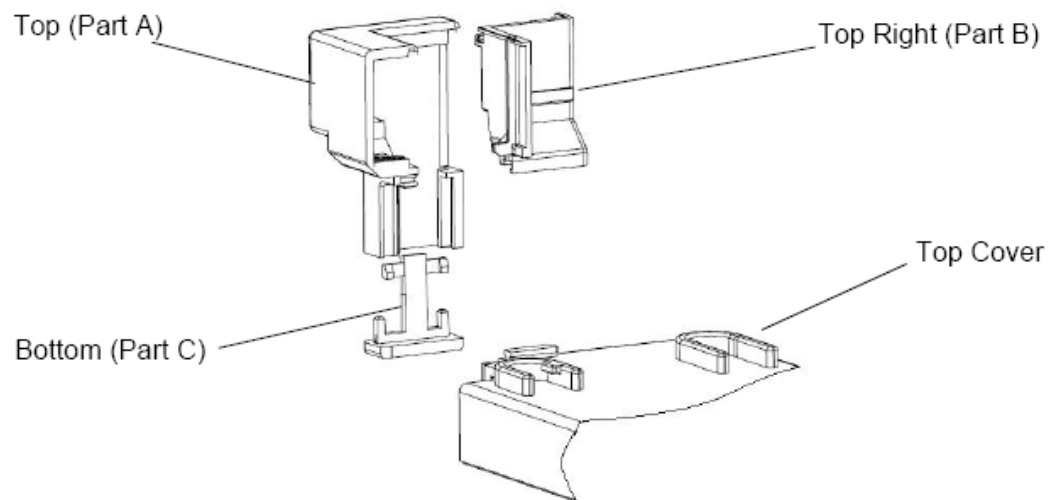
#### NOTE

Without these long mounting pins the MSE will not function properly.



### Removing the Dual Link Bar

The Dual Link Bar consists of three parts as shown below. Follow the specific steps carefully to remove the Link Bar.



---

#### CAUTION

Do not try to remove the link bar with force as this can damage the MSL Flex Cable

---

1. Position the MSE with the measurement connector hardware facing towards you.
2. Hold the link bar as shown below. While pressing gently on part B, insert a thick-bladed screwdriver between the MSL connector and part A. Twist the screwdriver to the left and at the same time slide part B to the right, so it is released at the top.



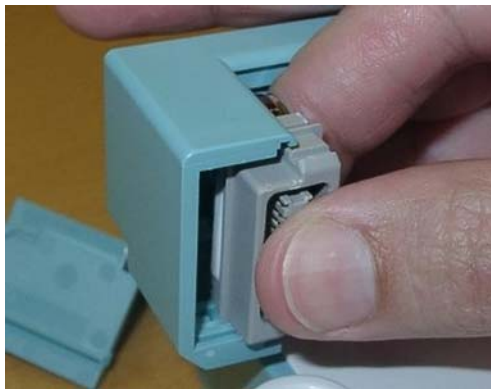
3. Repeat Step 2 at the bottom.



4. Slide part B to the right. If part B fails to move to the side, please repeat steps 2 and 3.



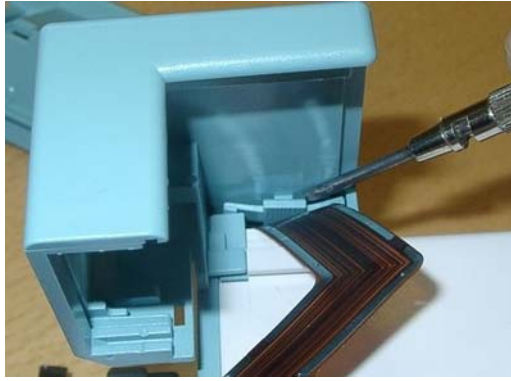
5. Now the MSL Flex connector can be moved to the right.



**NOTE**

Make sure that the movement of the screwdriver does not pinch the MSL flex cable.

6. Insert the thin-blade screwdriver behind the release mechanism of part C. Carefully twist the screwdriver, then press gently so that part C drops down.



7. Lift part A upwards. It is fixed in a dovetail. Be careful with the MSL flex.



### Removing the Top Cover

Begin by gently pulling away the top cover from the MSE. The top cover is press-latched at the link bar end. Remove it slowly, without hitting or touching the inside of the MSE.

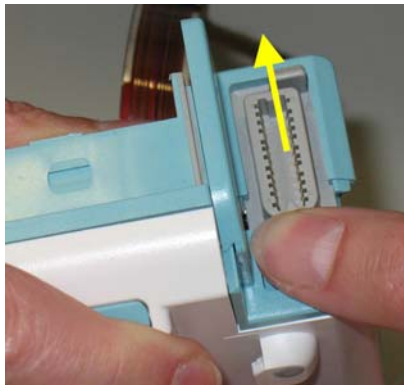


### Replacing the Flex Cable Assembly

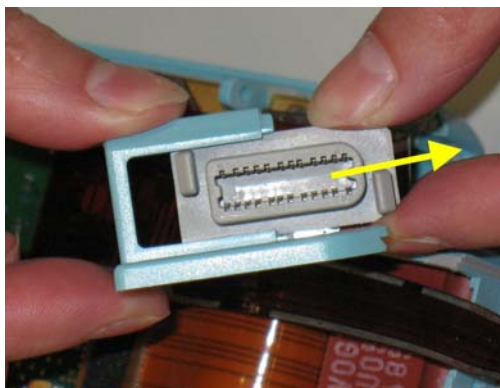
1. Hold the Extension firmly and push upwards against the connector. Then slide connector (together with the connector holder) out of the dovetail connection.

#### NOTE

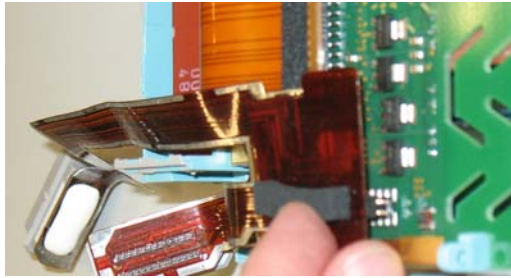
You will probably need to apply some more force at first until the holder slides out of its mechanical lock.



2. Slide the connector out of its holder.

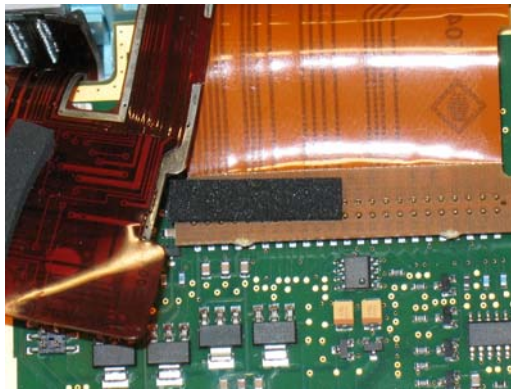


3. Remove the flex cable connector on the MSE board. Be careful not to bend any pins on the female part of the MSE connector.

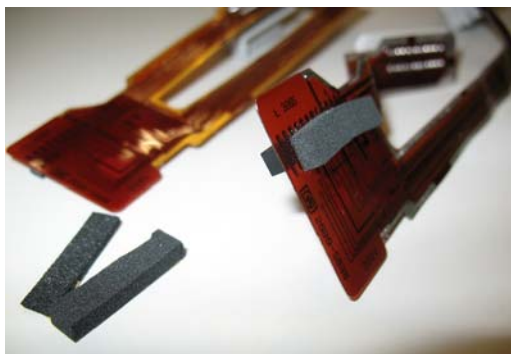


#### NOTE

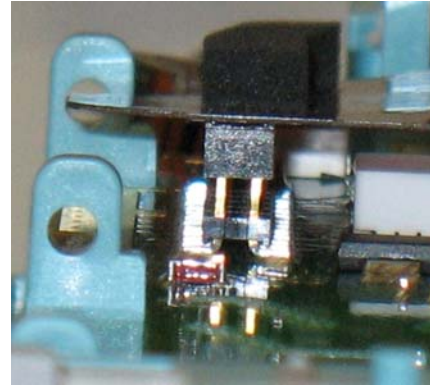
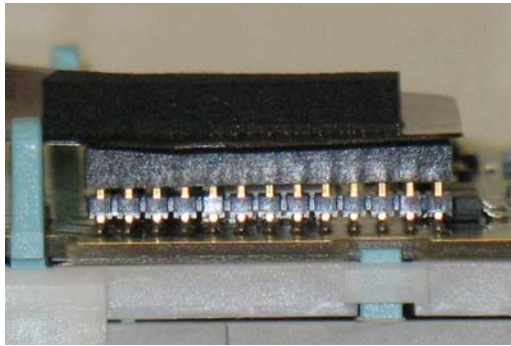
Some units may have a foam pad on the connector of the inner flex cable of the MSEs (as shown below) and some units may not. This has no impact on the functionality of these units.



4. Stick the correct foam pad on the rear side of the inner connector. Use the thick pad for : M3012A, M3014A, M3016A. Use the thin pad for: M3015A. You can also check the old flex cable for the correct pad.



5. Insert the flex cable connector into the female receptacle on the MSE board. **Check from the side and the front that the connector is inserted correctly (there is no mechanical guidance) and that no pins are bent, otherwise you may damage the MSE when powering it on.**



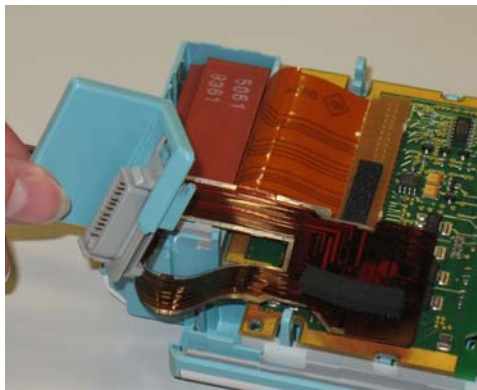
---

**WARNING**

A misplaced connector might damage the MSE or the monitor.

---

6. Slide the connector into the holder as shown below. Arrange the flex cable in the space beside and underneath the board (be careful not to bend the cable) while positioning the holder for insertion.



7. Insert the holder with the connector into the dovetail connection and slide it down until you hear a click.



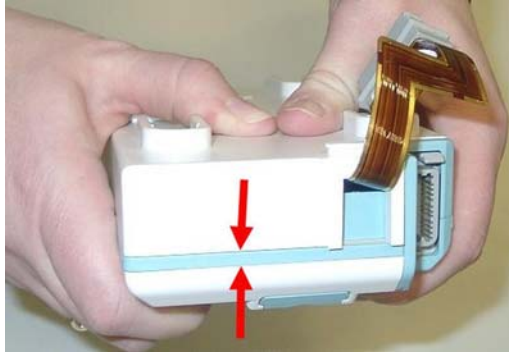


## Refitting the Top Cover

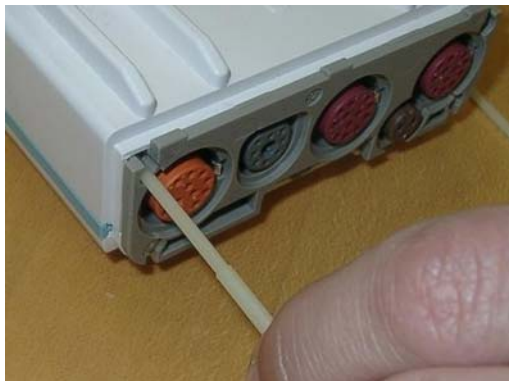
### NOTE

Be careful with the MSL Flex cable. Make sure it does not get stuck between the covers.

1. Position top cover, then press the bottom cover back into place until a click is heard.
2. The cover has a rubber seal. Press the covers firmly together and make sure there is no gap between the top and bottom cover.



3. Holding the bottom cover firmly in place, slide the two long mounting pins completely back into the MSE.



## Assembling the dual Link Bar

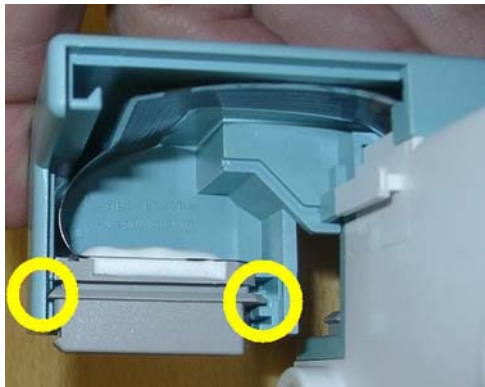
### CAUTION

Do not try to assemble any part of the link bar with force as this can damage the MSL Flex Cable.

1. Position part A into the dovetail and slide it down.



2. Make sure the MSL Flex connector is positioned in the correct slot (See indicated slots below). Then push it gently into part A.



3. Making sure the MSL flex cable lies flat in part A of the assembly, place part B into the dovetail and close the open link bar.





4. Turn the MSE around and insert part C into the bottom part of the link bar. When you hear a click, part C is correctly inserted.



### Refitting the Front Cover

To refit the front cover, press it back into place over the measurement connector hardware until you hear a click.



### Final Inspection

Perform a final inspection to ensure that:

- The link bar is positioned correctly
- There are no gaps between the link bar parts
- There is no gap between the top and bottom cover



## Testing

To ensure that the MSE is functioning correctly, you must perform a performance check on it. Please refer to the sections "Maintaining the Instrument" and "Testing the Instrument".

# Disassembly Procedures for the M3015A MMS Extension (HW Rev. A)

## NOTE

These procedures apply only to M3015A MMS with Serial Numbers DE020xxxxx.

It is recommended that you replace all the replaceable parts in the Extension (CO2 Scrubber and Pump) after 15 000 hours (approximately 3 years) of continuous use.

Tools Required:

- A thin-bladed screwdriver.
- A pair of large tweezers.
- In addition, for removing the pump, you will need a large-bladed screwdriver.

---

## WARNING

There is high voltage inside the Instrument (800V). Do not connect the MMS Extension to a Monitor while the Extension housing is open.

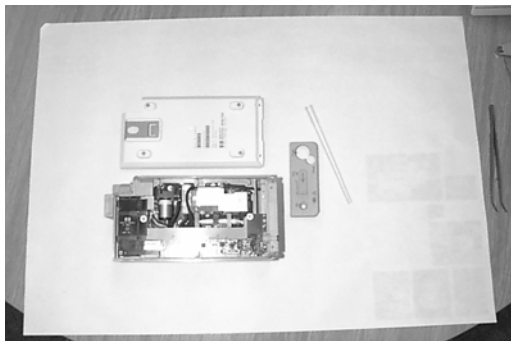
As well, parts inside the Instrument may be contaminated with bacteria. Protect yourself from possible infection by wearing examination gloves during these procedures.

---

## Removing the Front Cover

To remove the front cover, do the following:

1. Remove the server and the monitor from the extension.
2. Use a thin-bladed screwdriver to prise the grey front cover (the console covering the measurement connector hardware) gently from the bottom of the extension. Position the screwdriver in the small slits provided for this purpose. The front cover then clicks away from the extension.



3. Remove the front cover.

### Removing the Extension Bottom Cover

To remove the Extension bottom cover, do the following:

1. Position the extension on the dual link bar with the measurement connector hardware facing upwards and the arm of the dual link bar towards you. There are four long mounting pins threaded into the extension in each of the four corners under the cover. Locate the heads of the two long mounting pins on the side away from you
2. Use tweezers to prise the pins gently out enough to be removed by hand.
3. Remove the two pins and set them aside for refitting.

#### NOTE

Do not lose these long mounting pins since the Extension will not function unless they are in place.

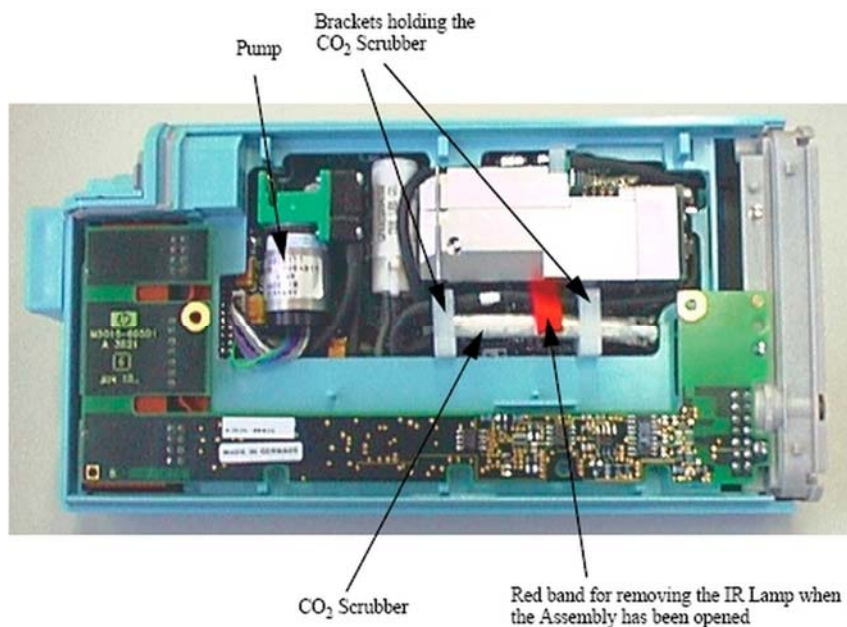


4. Using your hands, gently pry the bottom cover away from the Extension at the link bar end first. The bottom cover is press-latched at the link bar end. Remove it gently making sure not to bang or touch the inside of the Extension.

**NOTE**

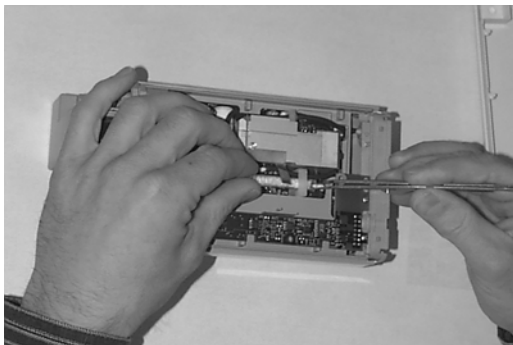
If you accidentally try to remove the wrong side of the bottom cover, you will notice that it is attached to the inside of the Extension with a ribbon connector and that the dual link bar prevents you from removing it completely. **Do not try to forcibly remove the wrong side of the M3015A cover; you cannot access replaceable parts from this side.**

The following illustration shows the location of the replaceable parts in the M3015A Measurement Server Extension.

**Removing the CO<sub>2</sub> Scrubber**

To remove the CO<sub>2</sub> Scrubber, do the following:

1. Locate the CO<sub>2</sub> Scrubber in the Extension.
2. Being careful not to touch anything else in the Extension, use tweezers to pull the body of the CO<sub>2</sub> Scrubber out of the bracket.



3. Holding the body of the CO<sub>2</sub> Scrubber with your fingers, carefully disconnect the Extension intake tube from the scrubber end and remove the CO<sub>2</sub> Scrubber from the Extension.

4. Dispose of the CO<sub>2</sub> Scrubber according to local legal requirements for low volume chemical waste.

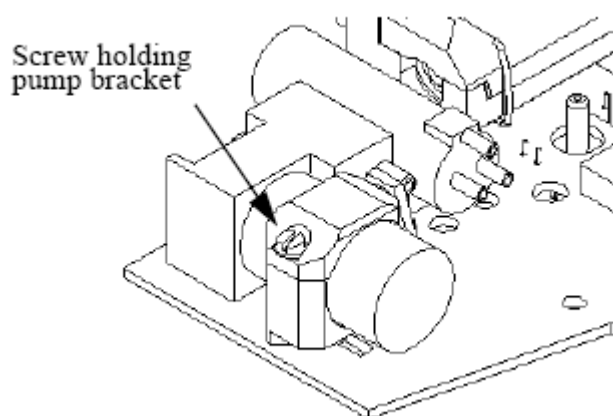
**NOTE**

Now that it is exposed, do **NOT** allow anything to fall into the Infrared Lamp assembly.

**Removing the Pump**

To remove the Pump, do the following:

1. Locate the Pump in the Extension.
2. Being careful not to touch anything else in the Extension, unscrew the screw holding the pump bracket in position. Lift the top part of the bracket away and lift out the pump.



3. Gently disconnect the flow tubing attached to the Extension from the Pump.

**NOTE**

Be sure to note which tube attaches to the inlet and which tube attaches to the outlet.

4. Gently disconnect the power lead which attaches the Pump to the Extension.
5. Remove the Pump.

**NOTE**

After replacing the Pump, reset the displayed value displayed using the Reset PumpOpTime selection (Service Mode>CO<sub>2</sub> Setup). When the PumpOpTime has been reset an INOP will be generated: "CO<sub>2</sub> OCCLUSION". To clear this INOP you must perform a flow check and store the flow in Service Mode (select "Store Flow")

## Refit Procedures for the MMS Extension

Tools Required:

- A thin-bladed screwdriver.
- A pair of large tweezers.
- In addition, for refitting the Pump, you will need a large-bladed screwdriver.

---

### WARNING

There is high voltage inside the Instrument (800V). Do not connect the MMS Extension to a Monitor while the Extension housing is open.

As well, parts inside the instrument may be contaminated with bacteria. protect yourself from possible infection by wearing examination gloves during these procedures.

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## Refitting the CO2 Scrubber

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### WARNING

The CO2 Scrubber contains lithium hydroxide monohydrate. This is a strong base. Do not open or damage the CO2 Scrubber. If you come into contact with the CO2 Scrubber material, flush the area immediately with water and consult a doctor.

---

To refit the CO2 Scrubber, do the following:

1. O2 Scrubber through the bracket to meet the Extension intake tube.
2. Push the intake tube firmly into the scrubber end to connect it.
3. Holding the body of the CO2 Scrubber with tweezers, feed the CO2 Scrubber fresh air intake under the second bracket and position it.

## Refitting the Pump

To refit the Pump, do the following:

1. Gently connect the power lead to the Extension.

### NOTE

The power lead can only be connected one way. Do not try to force the power lead into position. Instead, align it correctly and connect it gently.

2. Connect the flow tubing to the Pump.

### NOTE

Be sure to reconnect the inlet tube to the inlet valve and the outlet tube to the outlet valve.

3. Being careful not to touch anything else in the Extension, insert the pump into the bracket on the PC board. Make sure that the pump is horizontal and does not touch the PC board. (Vibration from the pump in operation will damage the Extension if the pump touches the PC board.)
4. Replace the top part of the bracket and screw firmly into position.

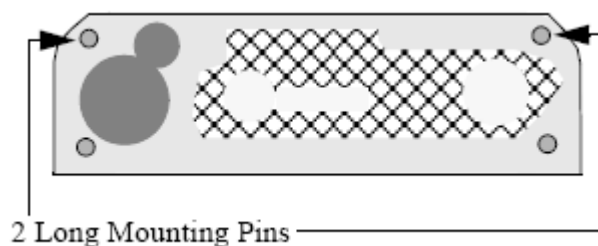
**NOTE**

After replacing the Pump, reset the displayed value using the Reset PumpOpTime selection (Service Mode>CO2 Setup). When the PumpOpTime has been reset an INOP will be generated: “CO<sub>2</sub> OCCLUSION”. To clear this INOP you must perform a flow check and store the flow in Service Mode (select “Store Flow”).

**Refitting the Extension Bottom Cover**

To refit the Extension bottom cover, do the following:

1. Latch the link bar end into place then press-click the bottom cover back into place covering the interior of the Extension.
2. Holding the bottom cover firmly in place, thread the two long mounting pins back into the Extension making sure to thread them all the way to the end.

**Refitting the Front Cover**

To refit the front cover, press-click it back into place over the measurement connector hardware.

**General Reassembly/Refitting Comments**

- Ribbon Connections—Make sure male-female ribbon connections are correctly lined-up.
- Open Component—Do not allow anything to fall into the open component.

**Following Reassembly**

Once you have reassembled the Instrument, you must perform a safety and performance check on the Instrument. Refer to *Testing and Maintenance*.

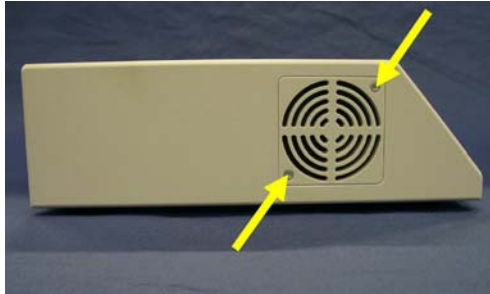
## Smart Battery Charger LG1480 (M8043A)

You should clean both air filter mats on a regular basis. Depending on the frequency of use and the environmental conditions (dust etc.), the interval can range from 6 to 24 months.

## Cleaning the Air Filter Mats

The air filters are located on the right and left side of the battery conditioner. Perform the procedure below for each side.

1. Remove the 2 screws securing the filter cover and take off the cover.



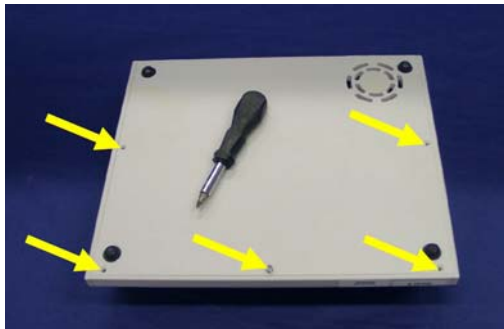
2. Remove the filter mat and clean the dust out by shaking.



3. Re-insert the mat and refit the cover and screws.

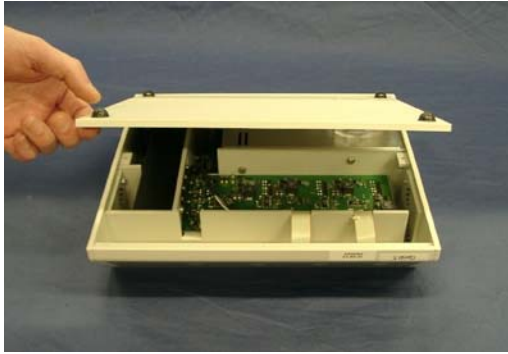
## Replacing the Fan

1. Turn the battery conditioner upside down and remove the 5 screws at the bottom with a T20 screwdriver.



2. Lift the bottom cover up at the front and pull it off.





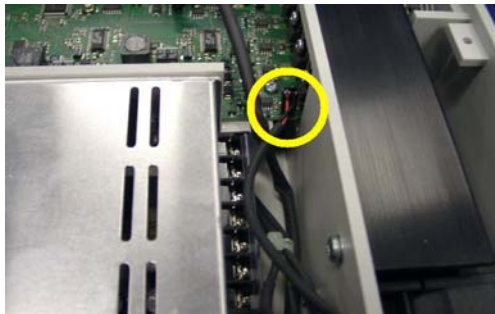
3. Unplug the fan connector from the main board.



4. Lift the fan out of the battery conditioner housing.



5. When replacing the fan make sure the connector is plugged in correctly as shown in the photograph below.



## IntelliVue Instrument Telemetry (IIT)

The following section describes how to exchange the IIT module.

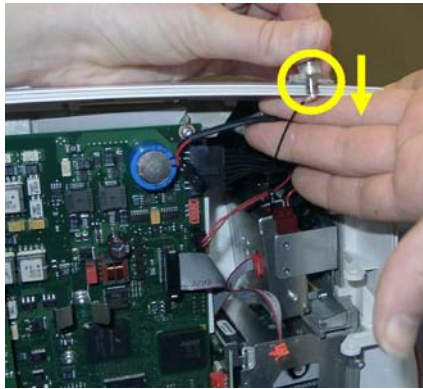
1. Perform the steps described in **2.0 Opening the Front of the Monitor** (on page 166) and **3.0 Separating the Front and Back Half of the Monitor** (on page 175)
2. Remove the three plastic pins securing the side cover.



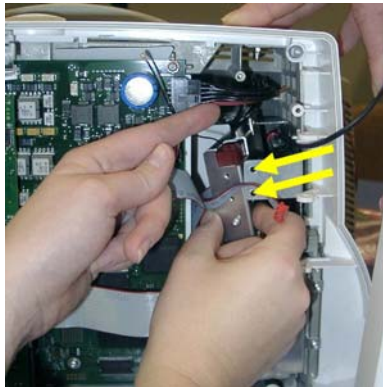
3. Disconnect the IIT module from the main board.



4. Disconnect the IIT module from the antenna connector plate.



5. Remove the two M3x6 screws securing the IIT module and pull out the module from behind the metal tab.



## Docking Station

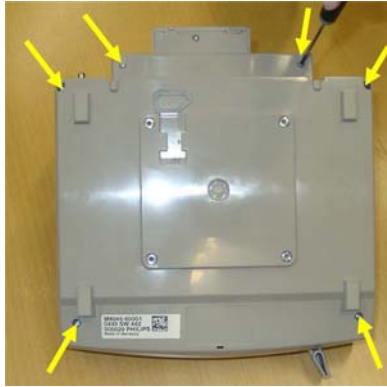
The following sections describe the exchange of the main board and the flex cable of the Docking Station.

### Exchanging the Main Board

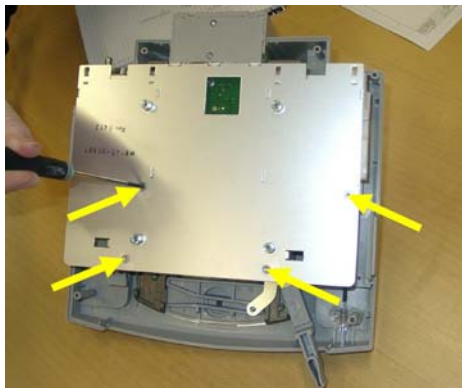
1. Remove the metal covers covering the alarm and video connectors and I/O slots.



2. Remove the six screws at the bottom of the docking station and lift the bottom cover off.



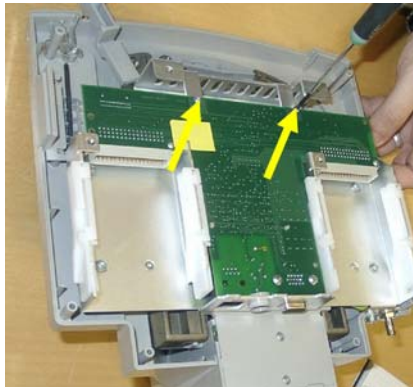
3. Remove the four screws securing the metal plate and lift it off.



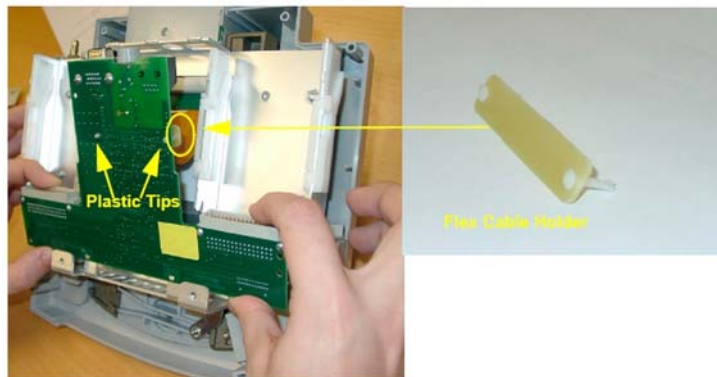
4. Remove the two screws next to the video connector.



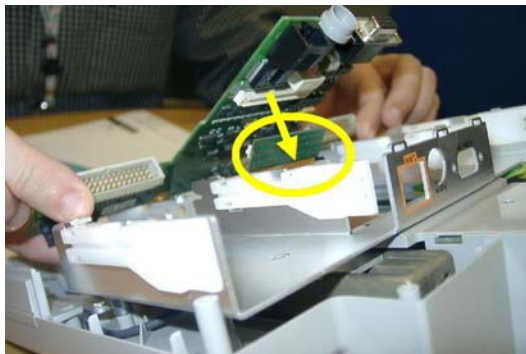
5. Remove the two screws on the main board.



6. Push the plastic tips through the board, lift the board up and remove the flex cable holder under the board.



7. Unplug the flex cable from the main board and remove the board.



8. Perform the above steps in reverse order to reassemble the docking station.

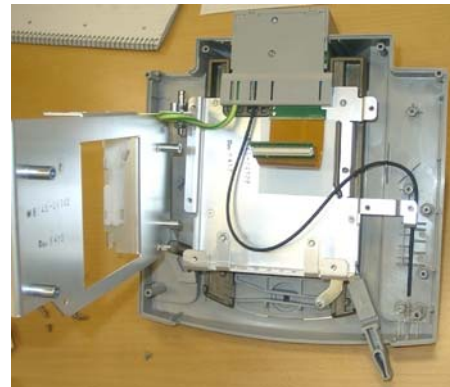
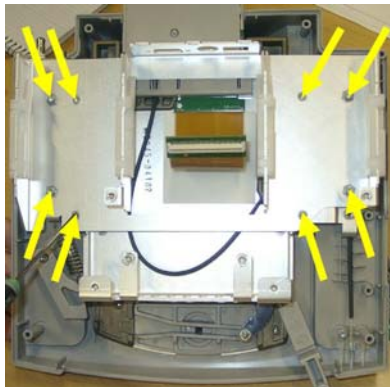


**Reassembly Note:** Make sure that the main board is placed on top of the metal flaps at the front of the docking station and not below..



### Exchanging the Flex Cable

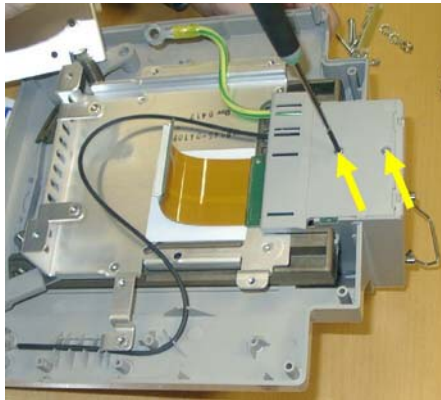
1. Perform the steps listed under “Exchanging the Main Board”.
2. Remove the eight screws and lift off the metal sheet to the side.



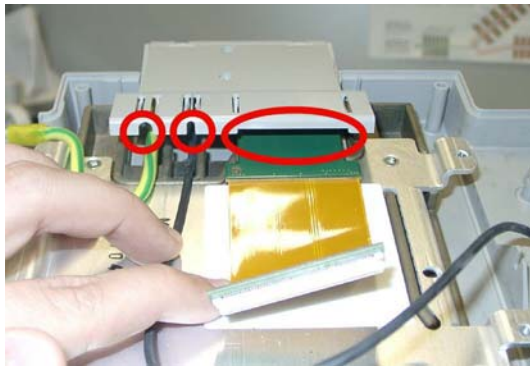
3. Remove the guide pins next to the flex connector on the front side of the power block.



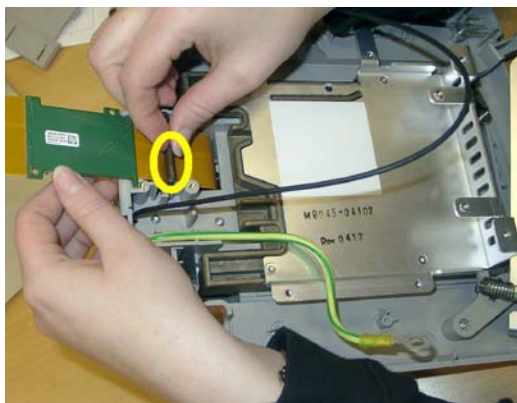
4. Remove the two screws from the bottom cover of the power block.



**Reassembly Note:** When reassembling the bottom cover of the power block, make sure that the grounding cable, the optic fiber and the flex cable run through the holes provided in the cover.

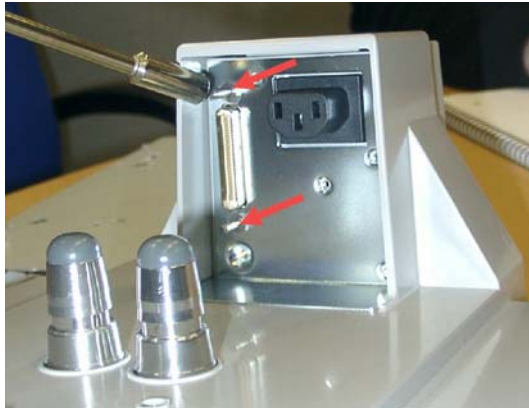


5. Remove the black Split Core and pull out the flex cable from the bottom.



6. Perform the above steps in reverse order to reassemble the docking station.

**Reassembly Note:** When re-inserting the flex cable it is recommended to secure it with the guide pins immediately.



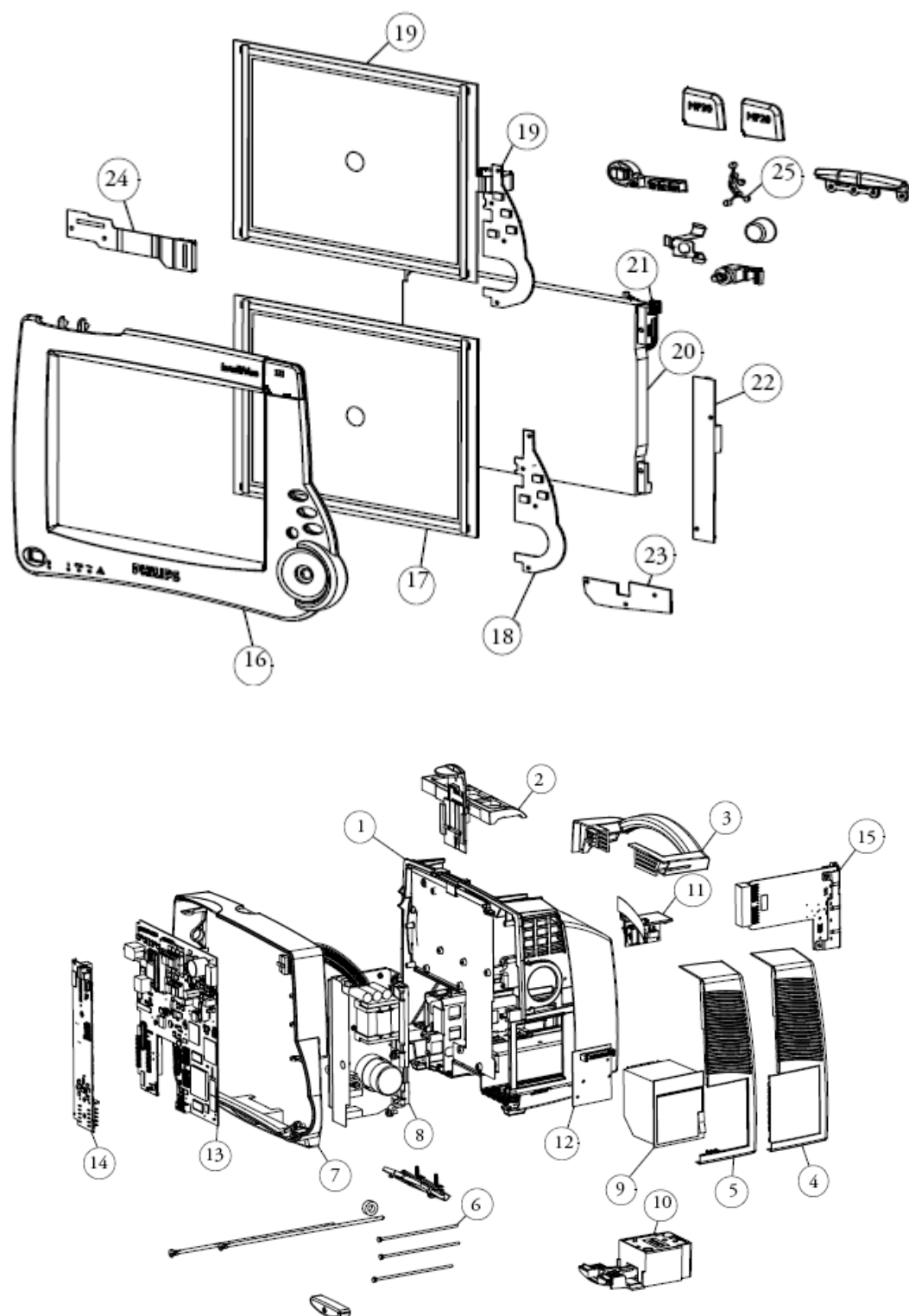


# Parts

This section lists the replacement and exchange parts for the following Philips IntelliVue Patient Monitoring System components:

- MP20/MP30 Parts
- ***Multi-Measurement Module (MMS) Parts*** (on page 223)
- ***MMS Extension Parts (M3012A, M3014A, M3015A and M3016A)*** (on page 230)
- ***Smart Battery Charger Part Numbers*** (on page 235)
- ***External Display Part Numbers*** (on page 237)
- ***Remote Alarm Device Part Numbers*** (on page 239)
- ***Remote Extension Device Part Numbers*** (on page 240)

## MP20/MP30 Parts



Note: Part numbers printed on the boards may be different from those listed here.

Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange	No. in Diagram
M8001-60501 <sup>1</sup>	451261003241	Rear Housing	New	1
M8001-42307	451261016801	MMS Lock	New	2
M8063-69501 or M8063-69561 <sup>2</sup>	453563499191 or 451261011901 <sup>2</sup>	MSL Assembly (w/o cable)	New	11
M8001-60506 <sup>3</sup>	451261011111 <sup>3</sup>	Frame Housing Assembly	New	7
M8001-60502	451261002051	Power Supply Assembly	New	8
M8001-68002	451261001741	Power Supply Assembly	Exchange	
M8058-68404 <sup>7</sup>	451261026621 <sup>7</sup>	Main Board PCA (see note 7 below for monitors with serial number <DE540xxxx)	Exchange	
M8067-66561	451261003381	Battery PCA	New	14
M8067-68461	451261003451	Battery PCA	Exchange	
M8003-69503	453563499111	Loudspeaker Assembly	New	
M8001-64603	451261003331	Backlight Tubes	New	
M8001-64022 <sup>4,5</sup>	451261015341	Touch Screen & Front Housing Assy (Text, English)	New	19 & 16
M8001-64023 <sup>4,5</sup>	451261015351	Touch Screen & Front Housing Assy (Symbols)	New	19 & 16
M8001-64012 <sup>4,5</sup>	451261015361	Non-Touch Screen & Front Housing Assy (Text, English)	New	19 & 16
M8001-64013 <sup>4,5</sup>	451261015371	Non-Touch Screen & Front Housing Assy (Symbols)	New	19 & 16
M8086-66562 <sup>4,6</sup>	451261015381	HIF Board (Touch)	New	18
M8086-66582 <sup>4</sup>	451261015391	HIF Board (Non-Touch)	New	18
M8001-00111	451261015401	Chassis	New	
M8001-64001	451261003271	LCD Display 10.4 inch	New	
M8001-66051	451261003341	Backlight Inverter PCA	New	22
M8077-66501	451261003391	Flex Adapter Cable	New	24
M8001-60003	451261003221	Side Cover Blank	New	4
M8001-44102	451261003201	Side Cover Recorder	New	5
M8001-44106	451261007921	Side Cover Recorder Antenna (IIT)	New	n/a

Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange	No. in Diagram
M8001-60004	451261007931	Side Cover w/o Recorder Antenna (IIT)	New	n/a
M8001-60901	451261003261	Handle	New	3
M8003-69021	453563499091	Quick Release Mount	New	10
M8001-64010	451261003291	Cable Kit (MSL, Backlight)	New	
M8001-64011	451261003301	Cable Kit (Rec, HIF, Power on)	New	
M8062-61002	451261030071	MP30 Cable Rec./SRL cable	New	
M8065-66581	451261003371	Carrier Power on LED PCA	New	23
M8001-60100	451261003231	Recorder	New	9
M8062-66561	451261003361	PCA recorder	New	12
M8092-67521	451261003421	Option Board Standard Assembly	New	
n/a	453564112081	Docking System Interface Board MP20/30 (includes 453564099331 IntelliVue Plastic Protective Bracket)	New	
n/a	453564099331	IntelliVue Plastic Protective Bracket Docking	New	
M8092-67501	451261003411	LAN-Wireless SVGA - nurse call	New	
M8081-67501	453563469621	IF MIB/RS232	New	
M8082-67501	453563469631	IF Centronics Printer	New	
M8086-67501	453563469651	IF HIF, Integral, PS 2	New	
M8089-67501	451261028241	IF USB	New	
M8087-67501	453563469681	IF Flexible Nurse Call Relay	New	
M8086-67521	453563469661	Remote IF	New	
M8003-47402	451261019561	Knob Navigation Point	New	
M8001-47402	45126101471	Key Silicone Pad	New	
M8001-44701	451261019571	Spacer HIF board	New	
M8003-60005	451261015961	Battery Door Assembly	New	

Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange	No. in Diagram
M8001-64015	451261003311 M8001-60501	Small Parts Kit including: Quick mount release cover Branding cover MP20 Branding cover MP30 Silicon pad - Power on/off LED Silicon pad - navigation point Spacer - navigation point ECG-out seal Lightpipe assembly Knob - navigation point Slit washer - navigation point knob Shielding - navigation point knob Encoder - navigation point knob Pin - front housing Pin - side cover Screw K30x8 Screw M3x6 Screw M4x10	New	6, 25 and photo below

<sup>1</sup>If this part is required for an MP20/MP20Junior with a serial number below DE50403738 or an MP30 with a serial number below DE50406811, you must also order a new quick release mount (M8003-69021).

<sup>2</sup>For monitors with a serial number of DE540XXXXX or higher. For monitors below this serial number order the older version.

<sup>3</sup>For monitors with a serial number of DE526XXXXX or higher. For monitors below this serial number, both the Frame Housing Assembly and the Front Housing Assembly must be replaced with a new version together.

<sup>4</sup>For monitors with a serial number of DE622XXXXX or higher. For monitors below this serial number order the older version.

<sup>5</sup>The new screens (touch and non-touch) M8001-64022/23/12/13 come together with the bezel, because the screen and bezel need to be factory adjusted (glued together)

<sup>6</sup>The new HIF board (touch) can now be replaced individually, since it no longer contains calibration constants of the touch screen.

<sup>7</sup>For monitors with a serial number smaller than DE540xxxxx, the new main board is not fully backwards compatible. If the main board for these monitors needs to be exchanged, the following parts need to be ordered in addition: M8063-69561(451261011901) MSL Assy and M8062-61002 (451261030071) SRL cable. See table above for details.

### Tools

Part Number 12NC Part No.	Description
M2267A 989803106081	Calibration Regulator
M1026-60144 453563230731	AGM Electronic Mass FlowMeter
15210-64010 989803100841	Gas Cal 1 cylinders for tcpCO2

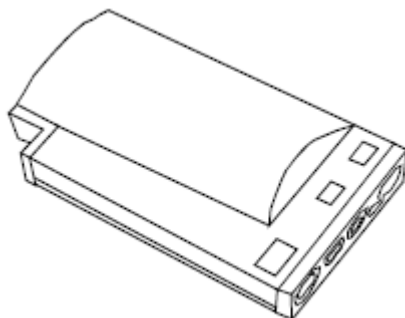
Part Number 12NC Part No.	Description
15210-64020 989803100851	Gas Cal 2 cylinders for tcpCO2
13907A 989803100361	Calibration Tube Assembly
M2505A 989803142701	Gas Cylinder Regulator
M2506A 989803142711	Verification Gas
M2776A 989803144561	Straight Sample Line
M3199-60101 453563337371	3ft UTP crossover cable orange, 0.9m
M3199-60102 453563337381	12ft UTP crossover cable orange, 3.6m

## Small Parts Kit



## Multi-Measurement Module (MMS) Parts

The primary support strategy for the Multi-Measurement Module is a unit exchange. However, some exchange parts are available: the MMS Top Cover, the MSL Connector Assembly and the front bezel. In order to determine which exchange parts need to be ordered check the serial number and the option string of the MMS as described below.



**M3001A Multi-Measurement Module**

### MMS Part Number Overview and Identification

Identify the correct MMS part number by checking the serial number prefix and the option string on the label on the rear of the MMS housing. The following picture shows the label of an M3001A. Use the table below to determine the hardware revision and the required exchange part.



Option	M3001A Option Description
#A01	Philips FAST SpO2
#A02	Nellcor OxiMax compatible
#A03	Masimo SET Technology
(#C00)	Standard
#C06	Add Pressure/Temp
#C12	Add 12 Lead ECG (only older revisions - see table below)
(#C18)	(Add Pressure/Temp and 12 Lead ECG) <b>old</b>

With Rel. G.0 option #C18 is split into #C06#C12

HW Revision	Possible MMS Software Revision	Serial Number Prefix	SW of monitor the MMS is connected to	Option String	Exchange MMS (for 12NC information please refer to tables in the following sections)
HW A	A.0 to G.0	DE227	A.0, A.1	--, C06, C12, C18, C06C12	M3001-68x10
		DE441	A.0, A.1	A01, A01C06, A01C12, A01C18, A01C06C12	
		DE227	>=A.2	--, C06, C12, C18, A01C06C12	M3001-68x02
		DE441	>=A.2	A01, A01C06, A01C12, A01C18, A01C06C12	
HW B	B.1 to G.0	DE441	>=A.2	A02, A02C06, A02C18, A01C06C12	M3001-68113 M3001-68x03
		DE512	>=A.2	A02, A02C06, A02C18, A01C06C12	
			>=A.2	A01, A01C06, A01C12, A01C18, A01C06C12	M3001-68114 M3001-68x04
HW C	D.0 to G.0	DE610 DE632 DE717	>=A.2	A01, A01C06, A01C18, A01C06C12	M3001-68x05
			>=A.2	A02, A02C06, A02C18, A01C06C12	M3001-68x08
		DE632 DE717	>=A.2	A03, A03C06, A03C18, A01C06C12	M3001-68x07



For further compatibility information please refer to the Software Compatibility Matrix in the Troubleshooting section.

Exchange Multi-Measurement Modules are shipped with English front bezels only. If you require a bezel in another language (compare the part numbers of your language to the English ones to check this) the front bezel has to be ordered additionally. Attach the appropriate bezel before putting the MMS into operation.

## MMS Firmware Overview

### NOTE

Multi-Measurement Modules (MMS) with HW Rev. A have a fixed firmware that cannot be upgraded. HW B and HW C MMSs allow upgrading of the SpO2 and ECG firmware.

To perform a FW upgrade, the MMS must have SW Revision C.0 or higher and be connected to an -USR\_ProductName- patient monitor.

## SpO2

Option	Serial Number Prefix	SpO2 FW Rev	Comment
#A01	DE227xxxxx DE441xxxxx	A.01.04	The HW and its interface do not allow a FW upgrade
#A01 #A02	DE441xxxxx DE512xxxxx DE610xxxxx DE632xxxxx	(A.01.41) -> A.01.46	Must be upgraded to A.01.46 - see internal Field Notification
		(A.01.42) -> A.01.46	
#A01 #A02	DE632xxxxx DE717xxxxx	A.01.46	Currently shipped FW
#A03	DE632xxxxx DE717xxxxx	Masimo SET FW	Not upgradeable by Philips

## ECG

Option	Serial Number Prefix	ECG FW Rev	Comment
#A01	DE227xxxxx	C.00.13	The HW and its interface do not allow a FW upgrade
#A01	DE441xxxxx	C.01.19	

Option	Serial Number Prefix	ECG FW Rev	Comment
#A01 #A02 #A03	DE441xxxxx	D.01.70	Upgradeable - see internal Field Notifications
	DE512xxxxx	D.01.76	
	DE610xxxxx	D.01.77	
	DE632xxxxx	D.01.78	
	DE717xxxxx	D.01.89	
		D.02.02	Currently shipped FW (requires MMS SW Revision F.0)

### MMS Part Numbers - Front Bezel for M3001 #A01 & #A03

Part Number	Description	Options
451261024391	MS_X1 Bezel w/o P/T Eng. Text	#C00, #C12
451261024401	MS_X1 Bezel w P/T Eng. Text	#C06 (#C18) #C06C12
451261024411	MS_X1 Bezel w/o P/T Symbols	#C00, #C12
451261024421	MS_X1 Bezel w P/T Symbols	#C06 (#C18) #C06C12

### MMS Part Numbers - Front Bezel for M3001 #A02

Part Number	Description	Options
451261024431	MS_X1 Bezel Nellcor w/o P/T Eng. Text	#C00, #C12
451261024441	MS_X1 Bezel Nellcor w P/T Eng. Text	#C06 (#C18) #C06C12
451261024451	MS_X1 Bezel Nellcor w/o P/T Symbols	#C00, #C12
451261024461	MS_X1 Bezel Nellcor w P/T Symbols	#C06 (#C18) #C06C12

**MMS Part Numbers - Top Cover and MSL Assembly**

<b>Option String</b>	<b>Description</b>	<b>12NC</b>	<b>Orderable Part #</b>
--, A01	MMS Top Cover 5ld w/o P/T Text, FAST	451261016401	M3001-68010
C06, A01C06	MMS Top Cover 5ld w/ P/T Text, FAST	451261016411	M3001-68011
C12, A01C12	MMS Top Cover 12ld w/o P/T Text FAST	451261016421	M3001-68012
C18, A01C18	MMS Top Cover 12ld w/ P/T Text, FAST	451261016431	M3001-68013
--, A01	MMS Top Cover 5ld w/o P/T Symbol, FAST	451261016441	M3001-68014
C06, A01C06	MMS Top Cover 5ld w/ P/T Symbol, FAST	451261016451	M3001-68015
C12, A01C12	MMS Top Cover 12ld w/o P/T Symbol FAST	451261016461	M3001-68016
C18, A01C18	MMS Top Cover 12ld w/ P/T Symbol FAST	451261016471	M3001-68017
A02	MMS Top Cover 5ld w/o P/T Text NELLCOR	451261016481	M3001-68018
A02C06	MMS Top Cover 5ld w/ P/T Text NELLCOR	451261016491	M3001-68019
A02C18	MMS Top Cover 12ld w/ P/T Text NELLCOR	451261016501	M3001-68020
A02	MMS Top Cover 5ld w/o P/T Symbol NELLCOR	451261016511	M3001-68021
A02C06	MMS Top Cover 5ld w/ P/T Symbol NELLCOR	451261016521	M3001-68022
A02C18	MMS Top Cover 12ld w/ P/T Symbol NELLCOR	451261016531	M3001-68023
A03	MMS Top Cover 5ld w/o P/T Text MASIMO	451261016541	M3001-68024
A03C06	MMS Top Cover 5ld w/ P/T Text MASIMO	451261016551	M3001-68025
A03C18	MMS Top Cover 12ld w/o P/T Text MASIMO	451261016561	M3001-68026

Option String	Description	12NC	Orderable Part #
A03	MMS Top Cover 5ld w/o P/T Symbol MASIMO	451261016571	M3001-68027
A03C06	MMS Top Cover 5ld w/P/T Symbol MASIMO	451261016581	M3001-68028
A03C18	MMS Top Cover 12ld w/ P/T Symbol MASIMO	451261016591	M3001-68029
n/a	MMS MSL Connector Assembly	451261016391	M3001-64050
n/a	M3015A Mounting Pin	453563100081	5041-8114

## MMS Exchange Part Numbers

### NOTE

The MMS always ships with the latest Software Revision. In order to make it compatible with the respective monitor the MMS may need to be upgraded or downgraded. From Support Tool version E.03.01 onwards the MMS can be up- or downgraded with every support tool license key (except general).

## M3001A #A01 Philips FAST SpO2 MMS Exchange Numbers

Language		Basic	Pressure/Temp Extension Option #C06	Conventional 12 Lead Option #C12	Conventional 12 Lead & Pressure/Temp Extension Option #C18
English Text	Exchange Part No. 12NC	M3001-68102 453563462911 or M3001-68110 451261017491 or M3001-68114 451261006041 or M3001-68105 451261013041	M3001-68202 453563486921 or M3001-68210 451261017501 or M3001-68204 451261006061 or M3001-68205 451261013061	M3001-68302 453563486931 or M3001-68310 451261017511 or M3001-68304 451261006081	M3001-68402 453563486941 or M3001-68410 451261017521 or M3001-68404 451261006101 or M3001-68405 451261013081

Language		Basic	Pressure/Temp Extension  Option #C06	Conventional 12 Lead  Option #C12	Conventional 12 Lead & Pressure/Temp Extension  Option #C18
Symbol (International)	Exchange Part No. 12NC	M3001-68502 453563486951 or M3001-68510 451261017531 or M3001-68504 451261006121 or M3001-68505 451261013101	M3001-68602 453563486961 or M3001-68610 451261017541 or M3001-68604 451261006141 or M3001-68605 451261013121	M3001-68702 453563486971 or M3001-68710 451261017551 or M3001-68704 451261006161	M3001-68802 453563486981 or M3001-68810 451261017561 or M3001-68804 451261006181 or M3001-68805 451261013141

**M3001A #A02 Nellcor OxiMAX-compatible MMS Exchange Numbers**

Language		Basic	Pressure/Temp Extension  Option #C06	Conventional 12 Lead & Pressure/Temp Extension  Option #C18
English Text	Exchange Part No. 12NC	M3001-68113 451261005361 or M3001-68108 451261015171	M3001-68203 451261005381 or M3001-68208 451261015191	M3001-68403 451261005401 or M3001-68408 451261015211
Symbol (International)	Exchange Part No. 12NC	M3001-68503 451261005421 or M3001-68508 451261015231	M3001-68603 451261005441 or M3001-68608 451261015251	M3001-68803 451261005461 or M3001-68808 451261015271

**M3001A #A03 MMS with Masimo SET SpO2 - Exchange Numbers**

Language		Basic	Pressure/Temp Extension  Option #C06	Conventional 12 Lead & Pressure/Temp Extension  Option #C18
English Text	Exchange Part No. 12NC	M3001-68107 451261013281	M3001-68207 451261013311	M3001-68407 451261013321
Symbol (Inter-national)	Exchange Part No. 12NC	M3001-68507 451261013341	M3001-68607 451261013371	M3001-68807 451261013381

**MMS Part Numbers - Label Kits**

Part Number	12NC Part Number	Description
M3001-64003	451261001191	Label Kit Alarm Symbols for MMS

**MMS Part Numbers - NBP Assembly**

Part Number	12NC Part Number	Description
M3001-64500	451261020561	NBP Assembly for MMS

**MMS Extension Parts (M3012A, M3014A, M3015A and M3016A)**

Exchange MMS Extensions are shipped with English front bezels only. If you require a bezel in another language (compare the part numbers of your language to the English ones to check this) the front bezel has to be ordered additionally. Attach the appropriate bezel before putting the MMS extension into operation.

The part numbers in the following parts table below, are used to order parts from your Philips representative. The item numbers correspond to the illustration which follows.

**MMS Extension Part Numbers - Release Mechanisms**

Part Number	12NC Part Number	Description
M3014-64200	451261012731	MMS Extension clips and springs (10 each) for MMS extension release mechanism (old version)
M3001-64600	451261012721	MMS Extension lever locks.(packet of 5) for MMS extension release mechanism (new version)

**MMS Extension Part Numbers - Top Cover, Flex Cable and Link Bar**

Part Number	12NC Part Number	Description
M3012-64620	451261016601	MSE Top Cover Assembly
M3012-64621	451261016611	MSE Link Bar Assembly
n/a	453564088851	MSE Flex Cable Connector Assembly

**MMS Extension Part Numbers - Front Bezels**

12NC Part No.	Description
<b>M3012A #C00 - Pressure, Temp &amp; Press/Temp</b>	
451261024471	M3012A Front Bezel P, T, P/T Eng. Text
451261024481	M3012A Front Bezel P, T, P/T Symbols

12NC Part No.	Description
<b>M3012A #C05 - Cardiac Output, Pressure, Temp &amp; Press/Temp</b>	
451261024491	M3012A Front Bezel C.O.,P, T, P/T Eng. Text
451261024501	M3012A Front Bezel C.O.,P, T, P/T Symbols
<b>M3012A #C10 - Cardiac Output, Continuous Cardiac Output, Pressure, Temp &amp; Press/Temp</b>	
451261024511	M3012A Front Bezel CCO, C.O.,P, T, P/T Eng. Text
451261024521	M3012A Front Bezel CCO, C.O.,P, T, P/T Symbols
<b>M3014A #A01 - Capnography Extension</b>	
451261024531	M3014A Front Bezel CO2 only Eng. Text/Symbols
<b>M3014A #C05 - Cardiac Output, Mainstream CO2, Pressure &amp; Press/Temp</b>	
451261024541	M3014A Front Bezel C.O., CO2, P, P/T Eng. Text
451261024551	M3014A Front Bezel C.O., CO2, P, P/T Symbols
<b>M3014A #C07 - Mainstream CO2, Pressure &amp; Press/Temp</b>	
451261024561	M3014A Front Bezel CO2, P, P/T Eng. Text
451261024571	M3014A Front Bezel CO2, P, P/T Symbols
<b>M3014A #C10 - Cardiac Output, Continuous Cardiac Output, Mainstream CO2, Pressure &amp; Press/Temp</b>	
451261024581	M3014A Front Bezel C.O., CCO, CO2, P, P/T Text
451261024591	M3014A Front Bezel C.O.,CCO, CO2, P, P/T Symb.
<b>M3015A #C06 Sidestream CO2 with Press/Temp</b>	
451261024601	M3015A Front Bezel CO2 w P/T Eng. Text
451261024611	M3015A Front Bezel CO2 w P/T Symbols
<b>M3015A Sidestream CO2 without Press/Temp</b>	
451261024621	M3015A Front Bezel CO2 w/o P/T Eng. Text
451261024631	M3015A Front Bezel CO2 w/o P/T Symbols



12NC Part No.	Description
<b>M3015A Pump Kit And Mounting Pin (only for HW Rev. A)</b>	
453563332261 (M3015-29303)	M3015A Pump Kit (including CO2 scrubber)
453563100081 (5041-8114)	Mounting Pin for M3015A
<b>M3016A (Press/Temp with Mainstream CO2)</b>	
451261024641	M3016A Front Bezel CO2, P/T Eng. Text
451261024651	M3016A Front Bezel CO2, P/T Symbols

## Exchange Parts List

Exchange parts are parts that have been returned to Philips and reconditioned for further use. Parts offered as exchange parts are in excellent service order according to rigorous Philips standards but offer you a considerable price advantage.

A front bezel with symbols instead of English text is provided with each exchange MMS Extension.

Part Number	12NC Part No.	Description
M3012-6801A	451261000201	exchange M3012A MMS Extension with Pressure, Temperature, Press/Temp
M3012-6831A	451261000341	exchange M3012A MMS Extension with Cardiac Output, Pressure, Temperature, Press/Temp
M3012-6861A	451261000491	exchange M3012A MMS Extension with Continuous Cardiac Output, Pressure, Temperature, Press/Temp
M3014-6801A	451261009281	exchange M3014A MMS Extension with CO2
M3014-6831A	451261009311	exchange M3014A MMS Extension with CO2, Cardiac Output, Pressure, Press/Temp
M3014-6891A	451261009461	exchange M3014A MMS Extension with CO2, Pressure, Press/Temp
M3014-6861A	451261009601	exchange M3014A MMS Extension with CO2, Cardiac Output/Continuous Cardiac Output, Pressure, Press/Temp

Part Number	12NC Part No.	Description
M3015-6801A	453563332431	exchange M3015A MMS Extension with Pressure/Temperature, English. (old hardware, S/N prefix: DE020xxxxx)*
M3015-6802A	451261005311	exchange M3015A MMS Extension with Pressure/Temperature, English. (new hardware, S/N prefix: DE435xxxxx)*
M3015-6831A	453563477871	exchange M3015A MMS Extension without Pressure/Temperature, English. (old hardware, S/N prefix: DE020xxxxx)*
M3015-6832A	451261005331	exchange M3015A MMS Extension without Pressure/Temperature, English. (new hardware, S/N prefix: DE435xxxxx)*
M3016-6801A	453563332581	exchange M3016A MMS Extension with CO2, English. #A01
M3016-6831A	453563483901	exchange M3016A MMS Extension without CO2, English. #A02

\*The new M3015 hardware offers an improved warm up time compared to the old hardware and the gas sample flow rate specification has been changed to 50 ml/min -7,5ml/min/+15 ml/min. Also, the Suppress Auto Zero feature and the capability to turn off the M3015A pump have been added. The new hardware is backwards compatible with all MP20-90 host monitors, but the new features will only be available in combination with a monitor with SW Rev. B.1 or higher.

## IntelliVue X2 Part Numbers

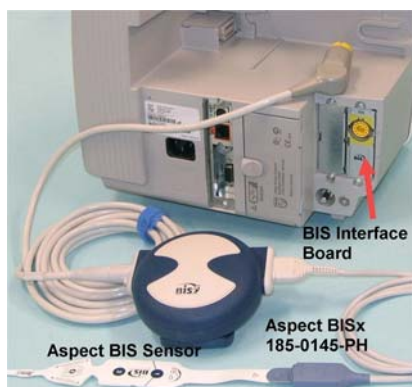
Please refer to the IntelliVue X2 Service Guide for IntelliVue X2 part numbers.

### BISx Solution Replacable Parts

Exchange Part Number	New Part Number	Description
n/a	M1034-61630 453563233721	BIS PIC (Patient Interface Cable)
n/a	M1034-61650 453563233731	BIS Sensor Simulator

Exchange Part Number	New Part Number	Description
M1034-68521 451261003621	n/a	BISx Power Link
n/a	M1034-61660	BISx Host Cable
n/a	M1034-47600	BISx bulkhead connector
n/a	M8080-67501 451261009241	BISx Interface Board
M1034-68500 453563233751	n/a	BIS Interface Module

### BISx Solution Components



**BISx Solution**

## Smart Battery Charger Part Numbers

### Exchange Assemblies

Exchange Part No.	12NC (Exch.)	Description
M8043-68000	453563498911	Exchange Smart Battery Charger

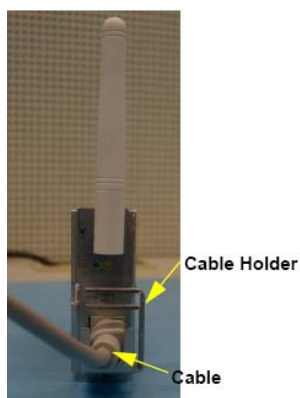
### Non-Exchange Assemblies

Exchange Part No.	12NC (Exch.)	Description
M8043-60010	451261001281	Replacement Kit: Air Fan & 2 Filter Mats
M8043-60011	451261001291	Replacement Kit: 2 Filter Mats

## IntelliVue Instrument Telemetry Part Numbers

Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange
M4840-65508	451261009031	IIT Module (incl. antenna cable) <b>US Version</b>	New
n/a	453564053561	IIT Module (incl. antenna cable) <b>Non-US Version</b>	New
M4840-68708	451261009041	IIT Module (incl. antenna cable) <b>US Version</b>	Exchange
M8058-61001	451261007891	IIT Flat Ribbon Cable	New
M4842-61300	453564007571	1.4 GHz AP Antenna <b>US Version</b>	New
n/a	453564052521	2.4 GHz AP Antenna <b>Non-US Version</b>	New

## IntelliVue 802.11 Bedside Adapter Part Numbers



Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange
M8096-68011	451261013031	IntelliVue 802.11 Bedside Adapter incl. cable and cable holder	Exchange
M2639-61001	451261013011	Cable Assembly	New
0955-1495	451261013001	Antenna WLAN Tri-band	New

## Docking Station Part Numbers

Ordering Part Number	Ordering Part Number 12NC	Description	New or Exchange
M8045-68001	451261009751	Docking Station Exchange	Exchange
M8098-67501	451261009761	Main Board Docking	New
M8098-66421	451261009771	Flex Cable Docking Station	New

## External Display Part Numbers



**M8031A and M8031B External XGA Displays**  
**External XGA Display Parts**

Product Number	Part Number	12NC Part No.	Description
M8031A	M1097-68004	453563241761	Exchange 15" Dual Mode XGA Color Touch Screen Display.
	M1097-64001	453563241731	Power Supply Mounting Clamp for M1097A.
	M1097-01201	453563241611	Mounting Bracket for M1097A.
	M1097-60006	453563282651	Power Supply.
	M1097-61604	453563241721	Adapter Cable.
	M1097-04702	453563241631	Desk Stand for M1097A Display.
	M1097-64100	451261012741	Replacement Kit for M1097A & M8031A
M8031B	M8031-68001	451261001941	Exchange 15" Medical Grade Display with Touch

Product Number	Part Number	12NC Part No.	Description
	M8031-60005	451261001921	Power Supply 12V for M8031B Display
	M8031-64001	451261001931	Power Supply Mounting for M8031B Display
	M8031-04701	451261001901	Monitor Desk Stand for M8031B/M8033C
	2090-0860	453563463201	Backlights for M8031B (old) for displays w/ serial no. < ANxx <b>0645</b> xxxxxx
	2090-0985	451261014381	Backlights for M8031B (new) for displays w/ serial no. >ANxx <b>0649</b> xxxxxx



***M8033A and M8033B External SXGA Displays***



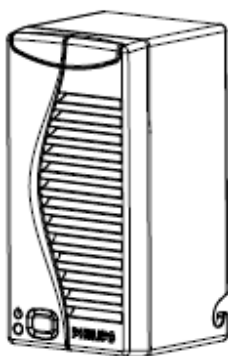
***M8033C External SXGA Display  
External SXGA Display Parts***

Product Number	Part Number	12NC Part No.	Description
M8033A	M8033-68001	453563480951	Exchange 17" SXGA Color Touch Screen Display.
	M8033-64100	451261014891	M8033A and M8033B Replacement Kit
	M8033-64001	453563480971	Power Supply Bracket Mount
	M8033-60005	453563480961	Power Supply.
	M8033-04701	453563480981	Desk Stand for M8033A and M8033B Display.

Product Number	Part Number	12NC Part No.	Description
M8033B	M8033-60002	451261006271	M8033B New 17" Medical Grade Display with Touch
	M8033-64100	451261014891	M8033A and M8033B Replacement Kit
	M8033-60006	451261006291	Power Supply 12V for M8033B Display
	M8033-64002	451261006301	Power Supply Mounting for M8033B Display
	M8033-04701	453563480981	Monitor Desk Stand for M8033A and M8033B Display
M8033C	M8033-68071	451261009161	M8033C Exchange 17" Medical Grade Monitor with Touch
	M8031-04701	451261001901	Monitor Desk Stand for M8031B/M8033C
	M8033-64603	451920880311	Backlights for M8033C

## Remote Alarm Device Part Numbers

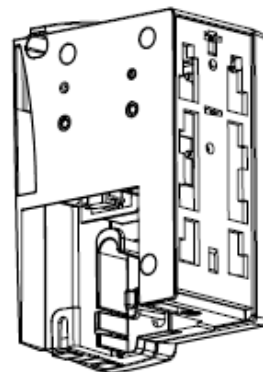
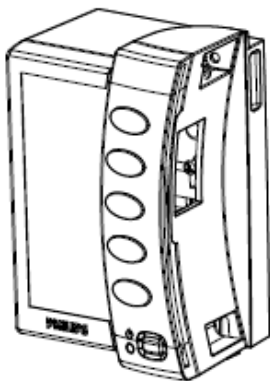
The Remote Alarm Device contains no servicable parts and can only be replaced in its entirety (part number M8025-60501 (12NC: 453563469801)). For cable part numbers please see the Site Preparation section.



**Remote Alarm Device Front and Rear View**

## Remote Extension Device Part Numbers

The Remote Extension Device contains no servicable parts and can only be replaced in its entirety (part number: M8026-60504 (12NC: 453563469821)). For cable part numbers, please see the Site Preparation section.



*Remote Extension Device Front and Rear View*



# Installation Instructions

The information contained in this chapter should enable the -USR\_ProductName- to be installed ready for use (the preparation and planning should be adhered to as specified in the *Site Preparation* section). Configuration of the system is explained in the Configuration Guide.

## Installation Checklist

Use this checklist to document your installation. Please file this installation record

Step	Task	Check Box when Task Done
1	Perform initial inspection of delivery, unpack and check the shipment	<input type="checkbox"/>
2	Mount the monitor as appropriate for your installation	<input type="checkbox"/>
3	Connect the monitor to AC mains using the supplied power cord	<input type="checkbox"/>
4	Perform Visual, Power On and Functional test blocks	<input type="checkbox"/>
5	Perform Safety Tests, if required by local laws and regulations	<input type="checkbox"/>
6	Load paper into the recorder, if present	<input type="checkbox"/>
7	Check/set the time and date	<input type="checkbox"/>
8	Check that the country-specific default settings are appropriate	<input type="checkbox"/>
9	Perform System Test as necessary	<input type="checkbox"/>

## Unpacking the Equipment

Your equipment will arrive in a carton similar to the ones pictured below. All components of the monitoring system are consolidated into a single packing crate. The contents of this crate depend on the options you have purchased. In addition to the monitor it can contain the following:

- MMS and user manuals
- MMS Extensions and accessories



### **Accessory and Monitor Packaging**

In the unlikely event of a defect on arrival, please keep the packing materials until you have completed the initial inspection.

## Initial Inspection

### **Mechanical Inspection**

Open the shipping container(s) and examine each part of the instrument for visible damage, such as broken connectors or controls, or scratches on the equipment surfaces. If the shipping carton/container is undamaged, check the cushioning material and note any signs of severe stress as an indication of rough handling in transit. This may be necessary to support claims for hidden damage that may only become apparent during subsequent testing.

### **Electrical Inspection**

The instrument has undergone extensive testing prior to shipment. Safety testing at installation is not required (except in situations where devices are interconnected forming a system, see Connecting Non-Medical Devices). An extensive self check may be performed. This recommendation does not supersede local requirements.

All tests are described in the *Testing and Maintenance* section of this manual.

## Claims For Damage and Repackaging

### Claims for Damage

When the equipment is received, if physical damage is evident or if the monitor does not meet the specified operational requirements of the patient safety checks or the extended self check, notify the carrier and the nearest Philips Sales/Support Office at once. Philips will arrange for immediate repair or replacement of the instrument without waiting for the claim settlement by the carrier.

### Repackaging for Shipment or Storage

If the instrument is to be shipped to a Philips Sales/Support Office, securely attach a label showing the name and address of the owner, the instrument model and serial numbers, and the repair required (or symptoms of the fault). If available and reusable, the original Philips packaging should be used to provide adequate protection during transit. If the original Philips packaging is not available or reusable please contact the Philips Sales/Support Office who will provide information about adequate packaging materials and methods.

## Mounting Instructions

Every type of compatible mounting solution is delivered with a complete set of mounting hardware and instructions. Refer to the documentation delivered with the mounting hardware for instructions on assembling mounts.

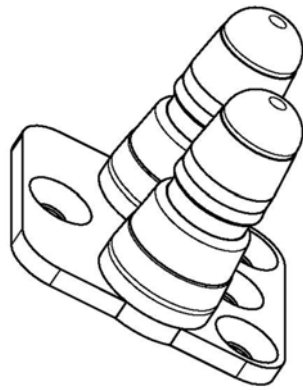
---

### WARNING

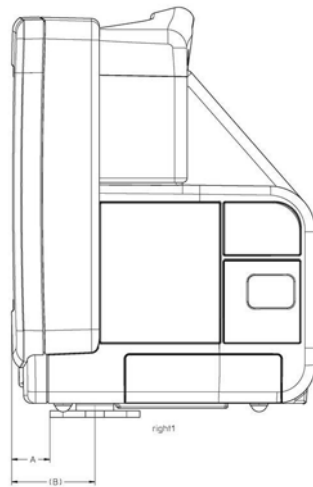
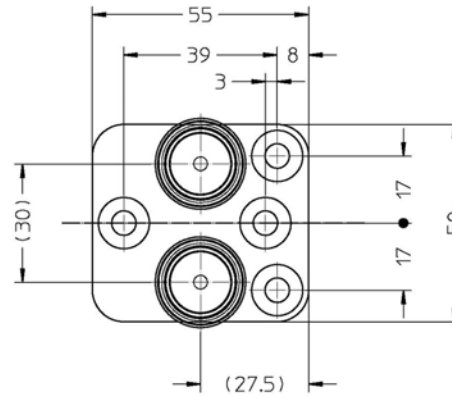
It is the customer's responsibility to have the attachment of the mounting hardware to the ceiling, wall, or mounting rail and the construction of the ceiling, wall, or mounting rail evaluated for structural integrity and compliance with all local, state and any other required codes by a registered, professional, structural and/or mechanical engineer.

Ensure that this commitment has been met before assembling mounts.

---



....



**Table Mount (M4046-64100, 12NC: 451261001381) - MP5 shown as an example**

	A	(B)
MP5	24	51.5
MP20/30	85.5	113
MP40/50	79.5	107
MP60/70	62	89.5

## Connecting the Monitor to AC Mains

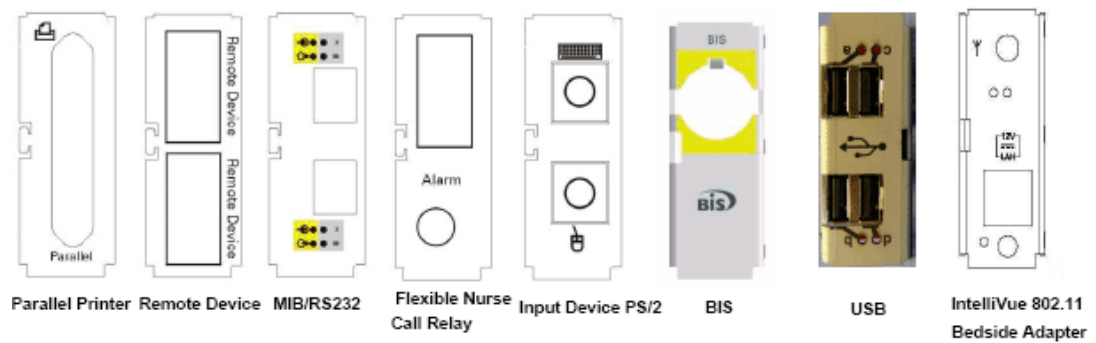
The monitor has a wide-range power supply that allows you to operate the monitor from an AC (alternating current) power source of 100 V to 240 V ( $\pm 10\%$ ) and 50/60 Hz ( $\pm 5\%$ ).

---

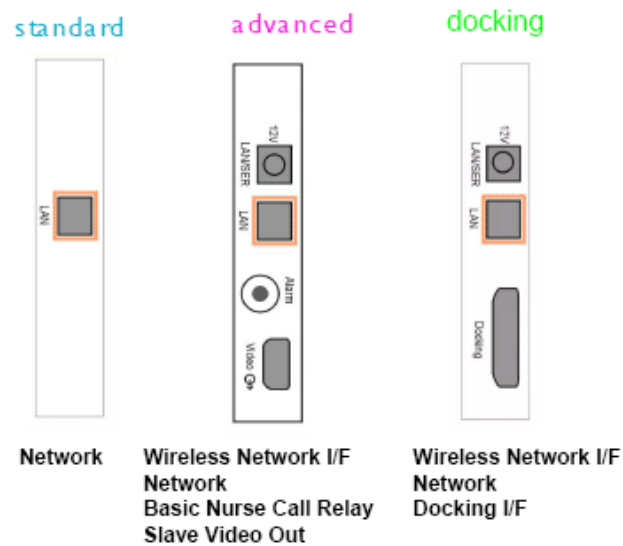
**WARNING**

- Always use the supplied power cord with the earthed mains plug to connect the monitor to an earthed AC mains socket. Never adapt the mains plug from the power supply to fit an unearthed AC mains socket.
  - Do not use AC mains extension cords or multiple portable socket-outlets. If a multiple portable socket-outlet without an approved isolation transformer is used, the interruption of its protective earthing may result in enclosure leakage currents equal to the sum of the individual earth leakage currents, so exceeding allowable limits.
  - Do not connect any devices that are not supported as part of a system.
  - Any non-medical device placed and operated in the patient's vicinity must be powered via an approved isolation transformer that ensures mechanical fixing of the power cords and covering of any unused power outlets.
-

## Connections



### I/O Boards & IntelliVue 802.11 Bedside Adapter



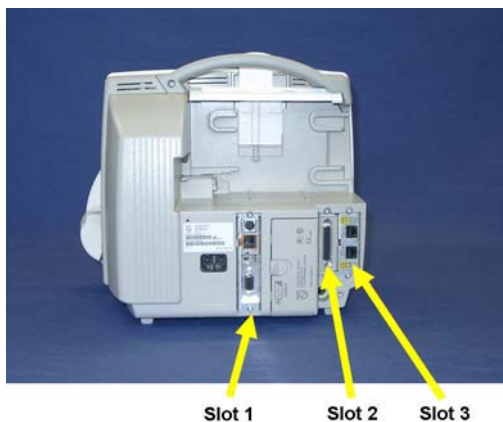
### System Interface Board

The following figure shows the cable and interface board connections.

### MP20/MP30 Cable and Interface Board Connections

## Installing Interface Boards

If you add interface boards to your monitor, you must insert them into the device according to the following rules:



- The following boards can be inserted into **slot 1**:
  - System Interface Board Standard
  - System Interface Board Advanced
  - Docking System Interface Board
- The following boards can be inserted into either **slot 2** or **slot 3**:
  - PS/2 (Input Device) Interface
  - Remote Interface
  - Parallel printer
  - Nurse Call Relay
  - MIB/RS232
  - BISx Interface
  - IntelliVue 802.11 Bedside Adapter
  - USB

**NOTE**

Only one of each of the boards listed above can be installed at a time except the MIB/RS232 board, of which a second board is allowed.

**NOTE**

Connections to the Remote Interface Board must be made as follows: the remote alarm device must be connected to the upper port and the remote input device to the lower port of the board.

The following table shows possible configurations for the MP20/30 patient monitors:

I/O Board		Possible Configurations														
Name	Possible I/O Slots	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
IntelliVue 802.11 Bedside Adapter	02,03	02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BIS Interface	03,02	03	03	03	03	03	03	03	03	-	-	-	-	-	-	-
USB Interface	02,03	x	x	02	-	x	02	-	-	x	02	x	x	02	x	02
Input Device IF	02,03	x	02	x	-	-	-	-	-	02	x	02	02	x	02	x
Remote Device IF	02,03	x	x	x	02	-	-	-	-	03	03	-	-	-	-	-
Parallel Port IF	02,03	x	x	x	x	02	x	-	-	x	x	03	-	x	-	-
Nurse Call Relays	02,03	x	x	x	x	x	x	02	-	x	x	x	03	03	-	-
MIB/RS232 (2x)	03,02	x	x	x	x	x	x	x	02	x	x	x	x	x	03	03
2nd MIB/RS232 (2x)	03,02	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

I/O Board		Possible Configurations														
Name	Possible I/O Slots	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
IntelliVue 802.11 Bedside Adapter	02,03	-	-	-	-	-	-	-	-	02	02	02	02	02	02	02
BIS Interface	03,02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



I/O Board		Possible Configurations														
Name	Possible I/O Slots	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
USB Interface	02,03	x	03	-	-	x	02	-	-	x	03	-	x	03	-	-
Input Device IF	02,03	-	x	-	-	-	x	-	-	03	x	-	-	x	-	-
Remote Device IF	02,03	02	02	02	02	-	-	-	-	x	x	03	-	x	-	-
Parallel Port IF	02,03	03	x	-	-	02	x	-	-	x	x	x	03	x	-	-
Nurse Call Relays	02,03	x	x	03	-	03	03	02	-	x	x	x	x	x	03	-
MIB/RS232 (2x)	03,02	x	x	x	03	x	x	03	03	x	x	x	x	x	x	03
2nd MIB/RS232 (2x)	03,02	x	x	x	x	x	x	-	02	x	x	x	x	x	x	x

“-” This board is assumed to not be required for this configuration

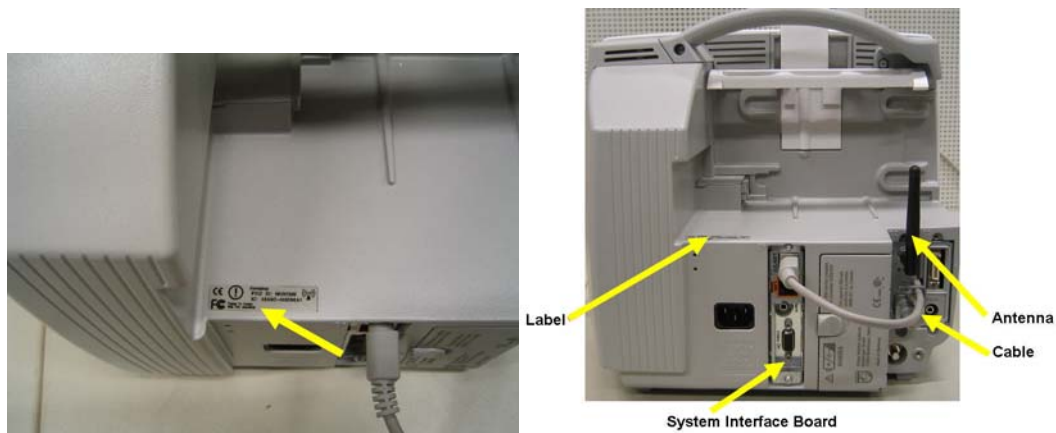
“x” This board cannot be assigned in this configuration

#### NOTE

Ensure that the board removal tool is snapped properly into place inside the battery compartment door after each use.

If two MIB/RS232 boards are installed, only one can be configured to Data Out. The other one can then only be configured to GM, Touch1 or Touch2.

If you have installed #J35 (IntelliVue 802.11 Bedside Adapter) please attach the approval label or the WLAN Label for Japan (country specific) and the antenna and plug in the cable as shown below.



**NOTE**

The installation of #J35 requires a system interface board with wireless functionality.

**Connection of Devices via the MIB/RS232 Interface**

The configuration of a specific MIB/RS232 port can be viewed in config mode and altered in service mode. This is required, for example, when a slave display with touchscreen is installed. To alter the configuration of an MIB port select **Main Setup** then **Hardware** then **Interfaces**.

**NOTE**

Be aware that if you change a port assignment this assignment is not reset upon boot up. If the MIB/RS232 board is removed and replaced with a different type of board the settings are deleted. If the MIB/RS232 board is then refitted, you must reconfigure the MIB/RS232 port. The configuration of MIB/RS232 is not cloned between services.

**Connection of USB Devices**

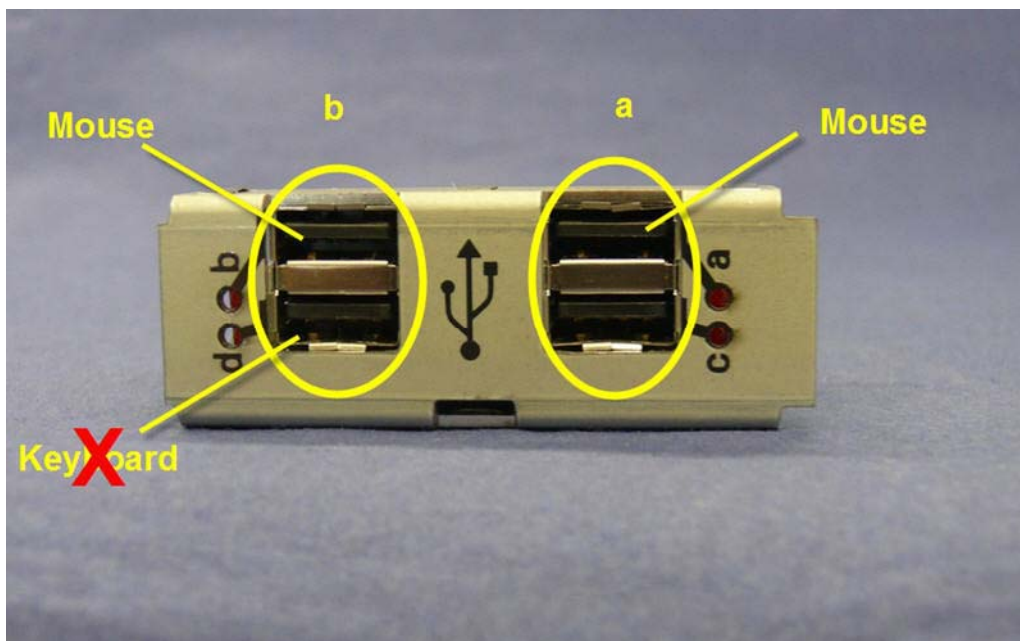
The USB IF board supports the following USB devices:

- printer
- keyboard
- barcode scanner
- computer mouse or trackball

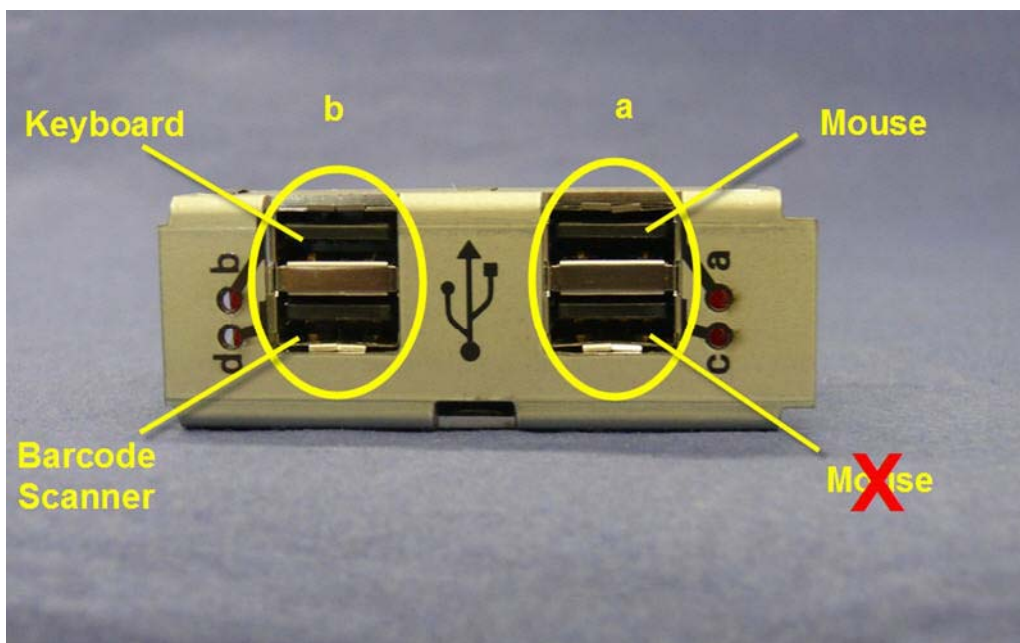
**NOTE**

Connect only the above mentioned devices to the USB Interface. Other devices are not supported.

As the patient monitor software only supports two input devices, only two input devices can be connected to the USB board. For this purpose, the USB ports are divided into two groups, a and b. Only one input device per group is allowed. In the graphic below, a mouse is connected to a port in each group. Therefore the keyboard is not recognized.



It is, however, possible to connect a mouse, a keyboard and a barcode scanner. In this case, the keyboard and barcode scanner are treated as one input device and must be connected to two ports of the same group.

**NOTE**

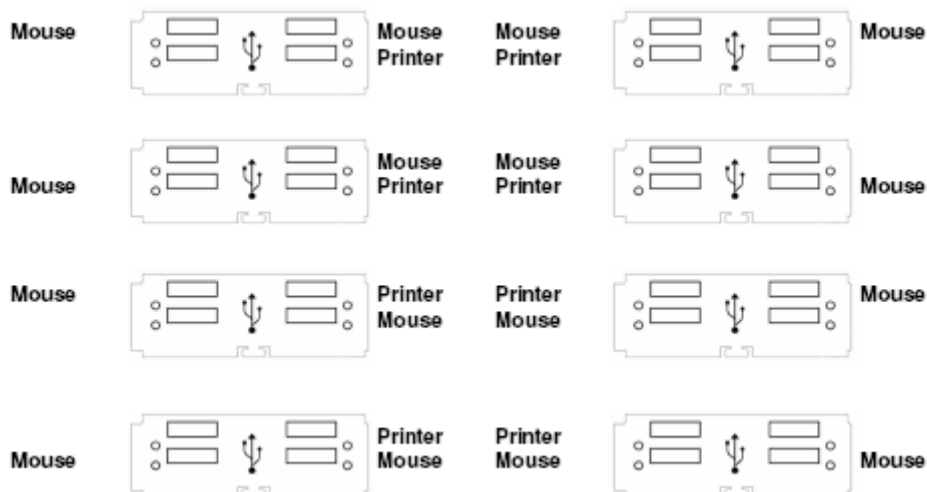
Other USB devices, e.g. USB sticks, iPods etc. are not supported by the USB IF board. **Do not** use USB adapters to connect PS/2 or other devices to the USB board.

### Possible USB Device Combinations

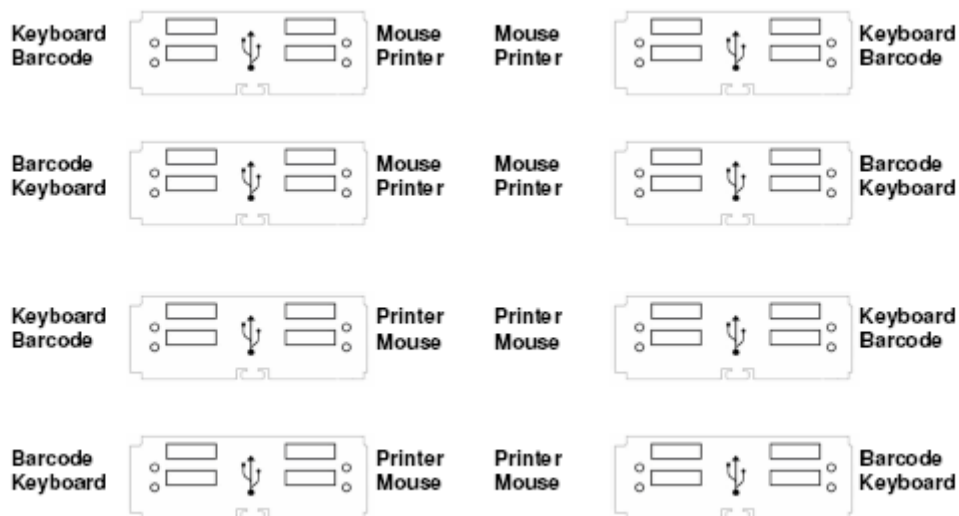
The following three groups of USB device combinations are supported:

- mouse/mouse combination
- keyboard/mouse combination
- keyboard/keyboard combination.

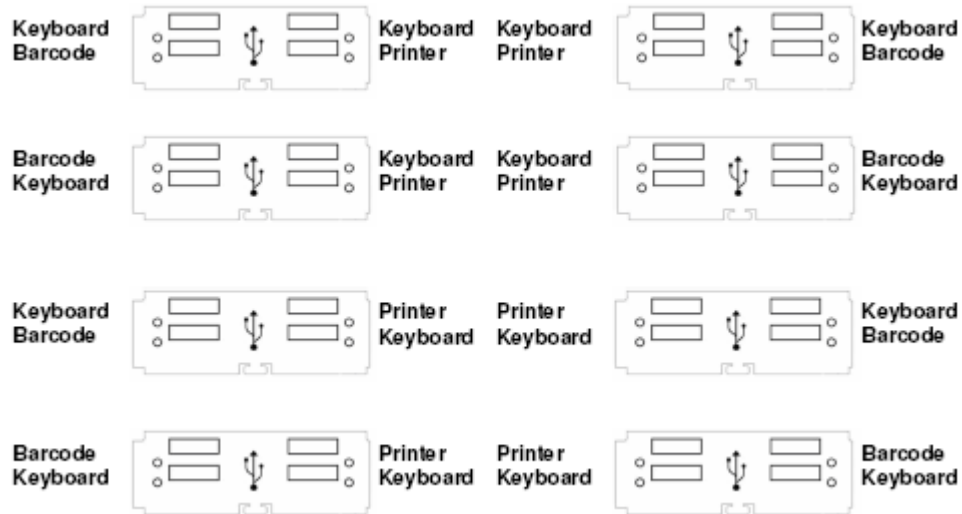
The figures below show the possible device combinations for each of the three groups.



#### Possible Mouse/Mouse combinations



#### Possible Mouse/Keyboard combinations



#### **Possible Keyboard/Keyboard combinations**

#### **NOTE**

Every time a new device is connected to the USB board, all connected USB devices are stopped and the ports are scanned. Depending on whether the combination is allowed or not, the devices will function again after the scan.

Combined input devices such as a keyboard with an integrated trackball are also supported. However, no additional mouse can be connected in this case. Multiple combined devices are also not allowed.

#### **CAUTION**

The USB interface does not provide an electrical separation. When connecting a USB device which uses an additional power supply e.g. printer, a separation device according to EN/IEC 60601-1-1 is required. After installation a system test is required to ensure that the resulting equipment leakage current does not exceed the limits of EN/IEC 60601-1-1. For detailed information see the Testing and Maintenance chapter.

#### **NOTE**

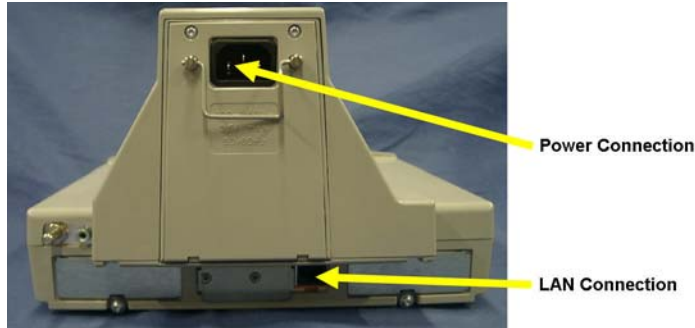
The USB board is not compatible with SW Revisions A.0x.xx. All other available SW Revisions are compatible.

#### **USB Error Indication**

The USB ports have a green LED each. If an error occurs, the LED is off. If the LED is on, the connected device is ready for operation.

## Installing the Docking Station

Make the power connection and the LAN connection to the docking station as shown in the photograph below.



## Installing Remote Devices

This section provides instructions for Philips products. Installation instructions for devices not sold by Philips must be provided by the device manufacturer.

### Mounting the 15" Remote Display (M8031A)

The Philips M8031A Color Flatscreen Display with the monitor as a slave display. A bracket is supplied with the display to connect it to a variety of Philips mounting devices.

A - Removing the desktop stand (if installed):

1. Remove the covers from the screws on the back of the flatscreen display
2. Remove the four screws from the back cover of the display and detach the cover.
3. Remove the four screws from the desktop stand and detach the desktop stand.

B - Attaching the bracket:

1. Place the bracket on the back of the display with the slits facing upwards.
2. Attach the bracket to the display with four M4x8 screws.

#### NOTE

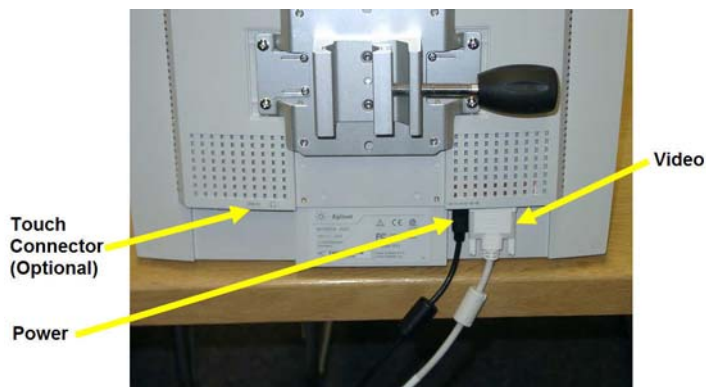
Attach the desired mounting device to bracket.

#### NOTE

Do not mount the display in a position where liquid could spill onto it.

## Connections

Connect the cables to the display as shown in the photograph.



## Mounting the 15" Remote Display (M8031B)

Mounting solutions for the M8031B must be purchased separately. Please refer to the installation instructions which ship with the mounting solution purchased.

## Connections

Connect the cables to the display as shown in the photographs below.



## Mounting the 17" Remote Display (M8033A/B/C)

Mounting solutions for the M8033A/B/C must be purchased separately. Please refer to the installation instructions which ship with the mounting solution purchased.

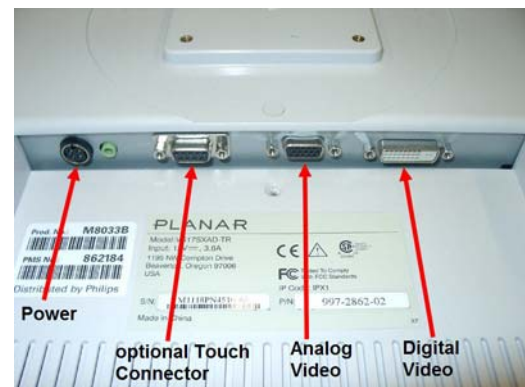
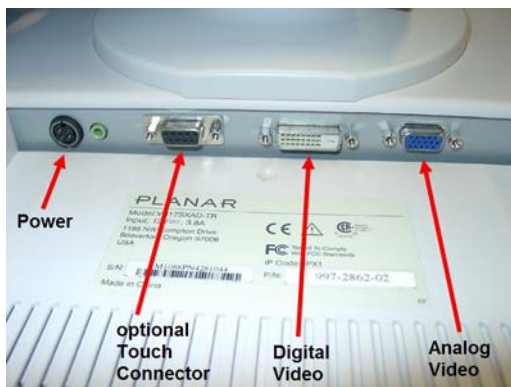


## Connections

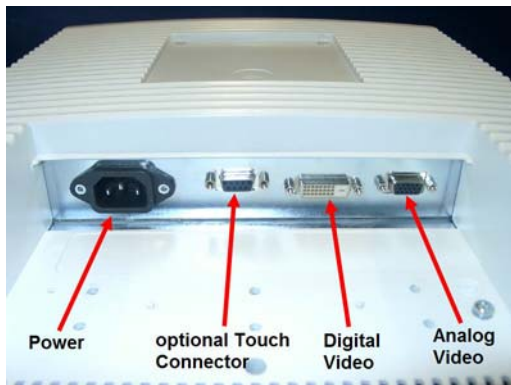
Connect the cables to the display as shown in the photographs below.



### Connections M8033A



### Connections M8033B (old and new version)



### Connections M8033C



## Video Cable Wiring Schematics



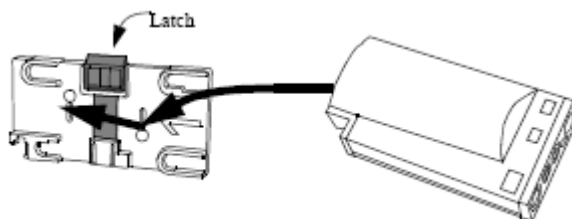
CIRCUIT DIAGRAM		
P1	WIRE	P2
1	RED COAX, CENTER	1
2	GREY COAX, CENTER	2
3	BLUE COAX, CENTER	3
5	BLACK	5
10		10
6	RED COAX, SHIELD	6
7	GREY COAX, SHIELD	7
8	BLUE COAX, SHIELD	8
11	BROWN	11
13	YELLOW	13
14	WHITE	14
SHELL	OVER SHIELD	SHELL

### Analog Video Cable Wiring Schematic

## Multi-Measurement Module

### Attaching the MMS to a Mount

1. Make sure the Measurement Server is oriented correctly relative to the mount (see the picture below).
2. Place the Measurement Server on the back mount. If it is not tight against the mount, slip it in the direction of the measurement connectors until it is.
3. Slip the Measurement Server forward until it clicks into place.



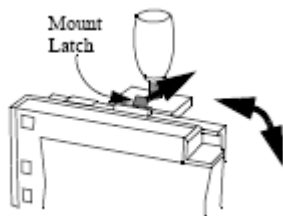
### Detaching the Measurement Server from a Mount

1. Press and hold the latch (in the middle at the top of the mount) away from the Measurement Server.
2. Slide the Measurement Server off the mount in the direction of the measurement connectors.

### Positioning the Measurement Server on a Clamp Mount

If you have your Measurement Server on the clamp mount, you can have it in one of four positions. You can reposition it as follows:

1. Press and hold the mount latch toward the clamp screw.



Rotate the Measurement Server and mount until you get it to the position you want.

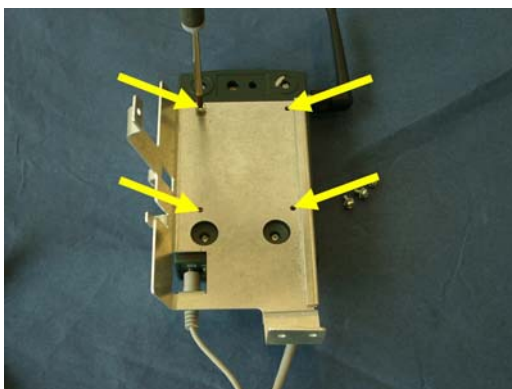
2. Release the mount latch, and make sure it is clicked into one of the four slots on the back of the mount.

### Mounting the Wireless Ethernet Adapter to the Monitor

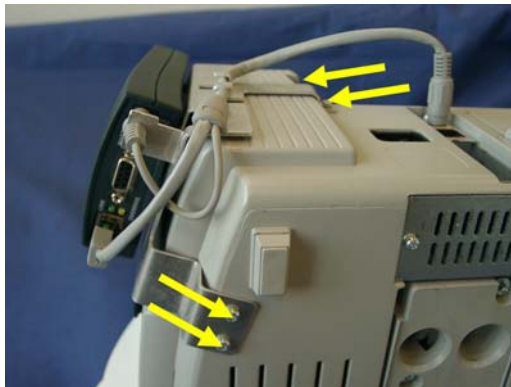
#### NOTE

The following procedure applies to the external (Proxim) wireless adapter only. To install the IntelliVue 802.11 Bedside Adapter, please refer to the section on installing interface boards.

1. Plug in the cable connection to the Wireless Ethernet Adapter.
2. Attach the Wireless Ethernet Adapter to the mounting device with the four cross-head screws provided.



3. Attach the mount to the monitor using the four M3x6 Torx screws provided. Plug in the cable to the monitor as shown below.

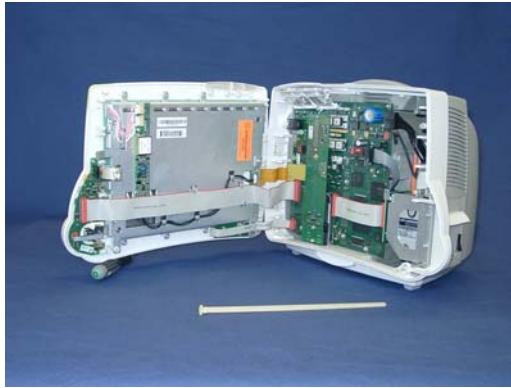


### Installing the IntelliVue Instrument Telemetry Adapter

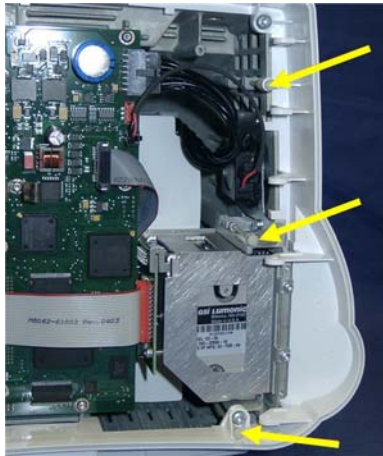
1. Turn the two plastic screw pins 180 degrees counterclockwise and pull them out. Use a small screwdriver to pull the screw head out of the recess in the housing.



2. The hinges allow the monitor to be opened like a book. Support the display before proceeding further.



3. Remove the three plastic pins securing the side cover and remove the cover.



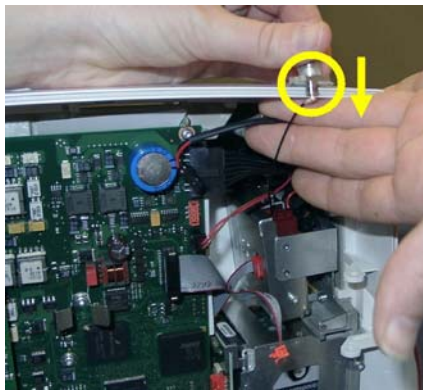
4. Remove the label from the top right of the monitor.



5. Insert the IIT adapter and secure it behind the metal tab with two M3x6 screws.



6. Connect the IIT adapter to the antenna connector plate. Be careful not to pull on the cable.



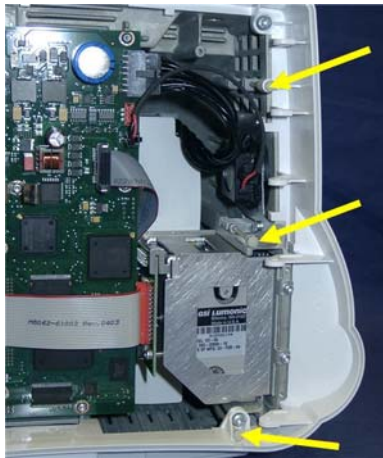
7. Insert the connector plate for the antenna from the bottom and tighten the two M2.5 x 8 screws on top.



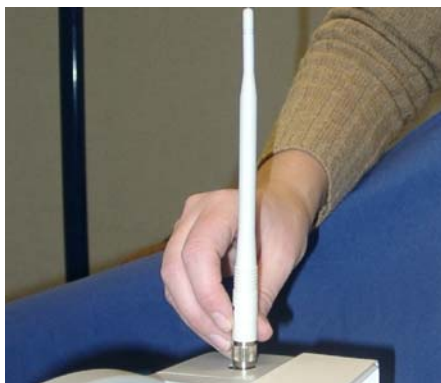
8. Connect the IIT adapter to the main board.



9. Take one of the side covers from the upgrade kit (either with or without recorder slot) with the hole for the antenna and put it on the monitor, securing it with the three plastic pins.



10. Reassemble the monitor by performing steps 1 & 2 in reverse order.
11. Screw on the antenna.



12. Perform the Power On Test block and the Safety Test block as described in your service guide.

### Frequency Coordination (USA only):

Frequency coordination is a registration and coordination process for wireless medical telemetry devices used in the U.S.A. which operate in the FCC-allocated Wireless Medical Telemetry Service (WMTS) bands (608-614 MHz, 1395-1400 MHz, 1427-1432 MHz). The M8001/2A #J45 and the M8004/5A with the IntelliVue Instrument Telemetry adapter M2638A operate in both of the 1395-1400 and 1427-1432 MHz bands.

Under U.S. Federal Communications Commission (FCC) rules, authorized healthcare providers must register their WMTS devices with an authorized Frequency Coordinator designated by the FCC. The American Society for Healthcare Engineering (ASHE) is the current designated Frequency Coordinator.

Registration/Coordination is a two-step process.

**Step 1: Registration:** Register the healthcare facility on-line, from the ASHE website ([www.ashe.org](http://www.ashe.org) (<http://www.ashe.org>)). **Click on the link for Wireless Medical Telemetry Service and come to the registration page. Fill out the details, and pay the associated fee as per the instructions provided. You will receive confirmation of this registration. Confirmation must be received before proceeding to the next step.**

**Step 2: Frequency Coordination:** Along with confirmation of registration, you will receive access information necessary to perform this second step, frequency coordination. This step involves logging the equipment and frequencies used into the FCC's database, so as to identify any existing potential interference and to help prevent potential future interference. Coordination is accomplished via the ASHE website. Click on the links for Wireless Medical Telemetry Service and then Frequency Coordination. The way the coordination process is executed as of today, **it will need to be repeated twice** for the M4840A system; once for the 1395-1400 MHz band, and then again for the 1427-1432 MHz band, both of which are used concurrently by the Philips product. There is a separate fee for each coordination request, which varies between \$250 and \$2000, depending upon the number of transmitting devices used and the band/s of operation. Coordination is executed by a company named Comsearch, on behalf of ASHE.

- To fill in the frequency coordination forms, you'll need to know the following:
- The county.
- Latitude and longitude that represents the center of the area where the transmitting devices will be deployed. Comsearch can help provide this information; [www.comsearch.com](http://www.comsearch.com) provides contact information.
- The name/s of the Clinical Unit/s using the devices (e.g. ICU4, CCU-West, ER1, Step-Down North, etc)
- The radius of deployment, expressed in meters. Imagine drawing a circle around the center of the clinical unit, that encloses/encompasses the unit. What is its radius?
- The number of the highest floor on which a transmitting device will operate.
- How many transmitting devices will be used, i.e. the total number of M8001/2A #J45 and M2638A IntelliVue Instrument Telemetry adapter devices combined.
- The Effective Radiating Power: 6.3 mW.
- The Equipment Manufacturer: Philips Medical Systems.



- The Model numbers: M8001/2A #J45 (MP20/30) and M2638A IntelliVue Instrument Telemetry adapter used with M8004/5A (MP40/50)
- The Frequency Range to be used: Two separate coordinations are required: For the first one, click on the range of 1395.0 through 1400.0 MHz. For the second one, click on all the frequency ranges listed in the range of 1427.0 through 1432.0 MHz.

When both Registration and Frequency Coordination have been successfully completed, the IntelliVue Instrument Telemetry System can be activated. Note that this process is the responsibility of the customer, as the final “operator” of the transmitting equipment.

## Connections

The cable specifications and part numbers for through wall solutions of the M3001A are described in the *Site Preparation* section of this manual.

## MSL Cable Termination

The following installation procedure describes how to install the wall installation cable kit when the patient monitor and the measurement server are not located at the same site. The kit consists of two connector boxes and a cable (15m or 25m).

For this procedure you need the insertion tool (M3086-43801) and a small screwdriver.

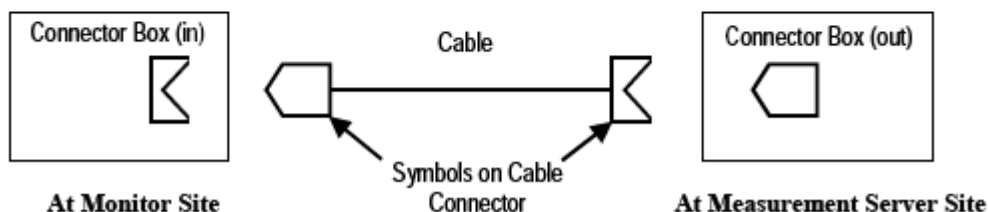
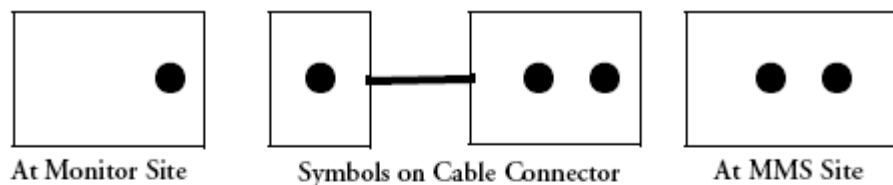
1. Draw the MSL cable through the wall from the site of the monitor to the site of the measurement server.

Each MSL face plate kit contains two connector boxes; one in-going and one out-going. (The US version contains an additional rectangular wall-mounting plate).

### NOTE


The installation procedure is the same for both connector boxes. This means you must perform steps 3 to 8 of this procedure twice.


The connectors on each box are different, so you must ensure that the correct box is placed at the correct location. The dots on the plastic angled cover indicates at which site you should install the box:





If there are no dots on the cover, symbols are used:

Symbol:  is connector box (in) and must be placed at the monitor site.

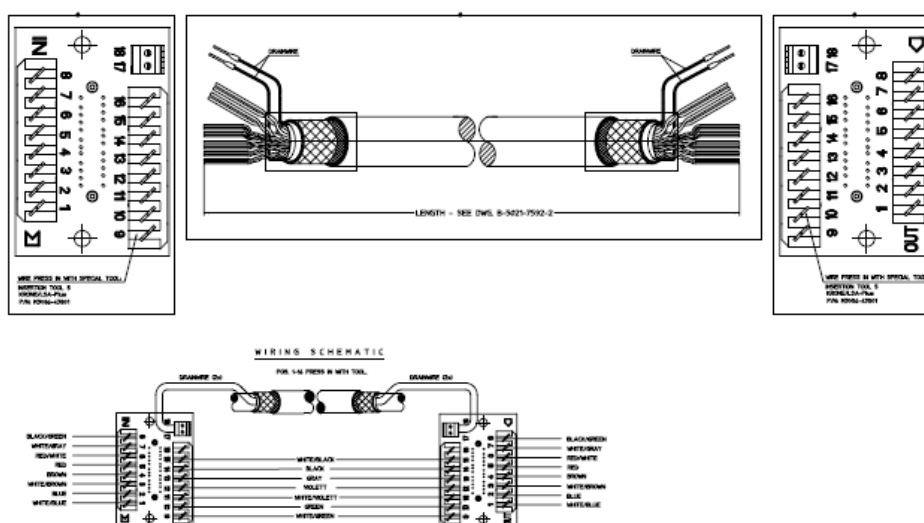
Symbol:  is connector box (out) and must be placed at the measurement server site.

The correct connector cable (M3081-61601, M3081-61602 or M3081-61603) has the opposite symbol:

2. Detach the PCB assembly (in/out) from the metallic mounting flange.
3. Use the Insertion Tool (M3086-43801) to position each wire on the PCB according the wiring schematic below, where each color corresponds to a number.

#### NOTE

The Insertion Tool should be set to cutting mode &= on.



#### Wiring Schematic

4. Use a small screwdriver to connect the two drain wires to the PCB, see the wiring schematic in .
5. Slide the PCB back on to the metallic mounting flange.
6. Use screws to fasten the mounting flange to the wall.

#### NOTE

US version only: Fasten the rectangular wall-mounting plate to the wall. Attach the mounting flange to the wall-mounting plate.

7. Mount the plastic cover. The plastic cover consists of two pieces:
  - Frame
  - Angled cover

Put the frame over the mounting insert and the PCB. Place the angled cover on top and fasten with two screws.

8. Connect the monitor and the measurement server to the wall installation.
9. Perform the following tests as described in the Test and Maintenance section of this manual:

- Power-on test blocks
- Safety test blocks
- ECG Sync Performance Test

## PS/2 Keyboard/Mouse

Switch off the monitor before connecting any PS/2 compatible device.

Connect the PS/2 connector either to the remote extension device or the PS/2 Interface board in the monitor at the slot indicated by the appropriate symbol.

The default keyboard language setting for all initial configurations is “US”. However, the monitor will not automatically select the best matching language for the keyboard depending on the language of its software. This means that there is no such choice as “Automatic” for the keyboard language.

To configure the keyboard language manually, go to Service Mode, select **Main Setup** -> **Hardware** -> **Keyboard** and then select the proper language. Please note that this setting does not clone.

## Philips Clinical Network (Wired)

Installation of the Philips Clinical Network should be performed by Philips service personnel. Use unshielded twisted pair (UTP) cables for installation of the clinical network. Refer to the installation instructions in the M3185A Installation Manual for further details.

## Philips Clinical Network (Wireless)

Refer to the installation instructions in the M3185A Philips Clinical Network Installation Manual for network installation instructions when using the wireless ethernet adapter. For instructions on connecting the wireless ethernet adapter, please refer to the instruction sheet shipped with the mounting device for the adapter.

### NOTE

The wireless ethernet adapter is not waterproof and therefore should not be installed anywhere where liquid could spill onto it.

Refer to the IntelliVue 802.11 a/g Infrastructure Installation and Configuration Guide for network installation instructions when using the IntelliVue 802.11 Bedside Adapter. For instructions on connecting the IntelliVue 802.11 Bedside Adapter, please refer to the Hardware Upgrade Guide for your bedside monitor.

# Nurse Call Relay

## Connections



Flexible Nurse Call Relay Connections at Monitor

Nurse Call Relay	Connectors	Contact	Isolation
Basic Nurse Call Relay	3.5 mm phone jack active closed contact only	≤ 100 mA, ≤ 24 VDC	1.5 kV
Flexible Nurse Call Relay	20 pin MDR (Mini D-Ribbon), active open and closed contacts, 3.5 mm phone jack, active closed contact only	≤ 100 mA, ≤ 24 VDC	1.5 kV

See Multi-Port Nurse Call Connector Test (Flexible Nurse Call) for details on the Nurse Call Relay Connector pin assignment.

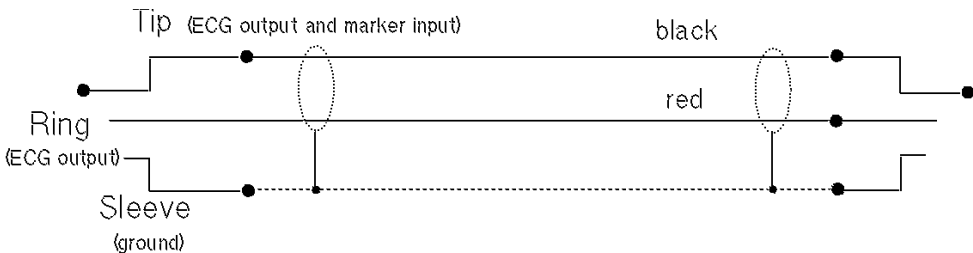
# ECG Out Functionality

## Connections

The cable M1181A #A62 has both ends terminated. The photograph above shows the monitor side connection.

If using a non-terminated cable:

- Strip 5 mm (3/16") insulation from leads and twist conductor strands tightly.
- Solder leads to the connector as shown in the following diagram.



---

**WARNING**

According to AAMI specifications the peak of the synchronized defibrillator discharge should be delivered within 60 ms of the peak of the R wave. The signal at the ECG output on the IntelliVue patient monitors is delayed by a maximum of 30 ms. Your biomedical engineer should verify that your ECG/Defibrillator combination does not exceed the recommended maximum delay of 60 ms.

---

## Configuration Tasks

You must configure these settings during installation in configuration mode.

- Line Frequency
- Printer
- Altitude
- Equipment Label (for wireless networked monitors, or when the Information center is in flexible monitoring mode).
- IP Address, Subnet Mask and Default Gateway (for manual IP Address Configuration - only in **service mode**)
- ECG cable colors
- Height and Weight units
- IGMP, CI Mode, CI Address, CI TTL (for Customer Supplied Clinical Network (CSCN) Routed Bedside Configurations - only in **service mode**)

### Checking Country-Specific Default Settings

Some settings are made in the factory to match the typical requirements in a specific country. Line frequency, units for weight and height, and ECG cable colors (AAMI or IEC) have been set to appropriate values. If you suspect that these settings may not match your institution's requirements, check the settings and change them if necessary as described in the *Configuration Guide*.

---

**WARNING**

Before starting monitoring, check that the configuration meets your requirements, especially patient category, alarm limits and paced setting.

---

If you need to enter configuration mode:

1. In the **Main Setup** menu, select **Operating Modes**.
2. Select **Config** and enter the passcode.  
The passcode for configuration mode is given in the monitor's service documentation.

The monitor displays **Config** at the right hand side of the status line and in the center of the Screen while you are in configuration mode.

Before you leave configuration mode, always be sure to store any changes you made. You must store changes made to each Settings Block and to each Profile, individually. As it may be difficult to remember whether the settings you changed belong to a Monitor Settings block or a Measurement Settings block, we recommend that you store each block before you leave configuration mode.

To leave configuration mode:

- ▶ In the **Main Setup** menu, select **Operating Modes** and then select **Monitoring**.

## Setting Altitude, Line Frequency, ECG Cable Colors and Height & Weight Units

You require a local barometric pressure rating from a reliable source (such as airport, regional weather station, or hospital weather station) that is located at the same altitude as the institution.

1. From the **Main Setup** menu, select **Global Setting**. Select **Altitude** and enter the altitude.
2. From the **Main Setup** menu, select **Global Setting**. Select **Line Frequency** and choose the Line Frequency.
3. From the **Main Setup** menu, select **Global Setting**. Select **ECG Cable Color** and choose the Cable Color.
4. From the **Main Setup** menu, select **Global Setting**. Select **Height Unit** and choose the Height unit.
5. From the **Main Setup** menu, select **Global Setting**. Select **Weight Unit** and choose the Weight unit.

## Setting Altitude and Line Frequency

You require a local barometric pressure rating from a reliable source (such as airport, regional weather station, or hospital weather station) that is located at the same altitude as the institution.

1. From the **Main Setup** menu, select **Global Setting**. Select **Altitude** and enter the altitude.
2. From the **Main Setup** menu, select **Global Setting**. Select **Line Frequency** and choose the Line Frequency.

## Configuring the Equipment Label

If the Information Center is in fixed monitoring mode, it controls the equipment label. You do not need to follow this procedure.

However, if you are on a wireless network, or your Information Center is configured for flexible monitoring mode, you must set the equipment label. This associates the monitor with a central monitoring sector. An identical monitor label must also be configured in the Information Center.

1. Select the **Bed Label** screen element to call up the **Bed Info** menu.

2. Select **Equipment Label** to call up the onscreen keyboard.
3. Enter the system identifier. This needs to be set up in either the monitor or the information Center. If the Information Center is in flexible monitoring mode, the monitor must be setup to match the Information Center's monitor label.

### Configuring the printer

1. From the **Main Setup** menu select **Reports**.
2. Select **Printer Settings** and configure **Local** to enabled if the printer is connected directly to the monitor. See configuration guide for further details.

### Configuring IP Address, Subnet Mask and Default Gateway

Typically the automatic configuration via the BOOTP Server of the central station is used. In this case all fields are set to 0.0.0.0. For special requirements, it is possible to switch to a manual/fix IP address configuration.

#### NOTE

- Only limited checks of the manual values are possible. Therefore, it is mandatory that a manual configuration is only performed by an experienced service person to avoid problems such as duplicate IP addresses, non matching subnet mask, etc.
  - The second CPU of an MP90 does not support a manual configuration and therefore will always request the IP configuration via BOOTP.
1. Select the **Bed Label** screen element to call up the **Bed Info** menu.
  2. Select **IP Address**. If the IP Address is set to 0.0.0.0, all values are dynamically requested from a BOOTP Server. Otherwise the manually entered address is used.
  3. Select **Subnet Mask**. The Subnet Mask must be provided for manual IP addresses. The Subnet Mask must consist of a single consecutive series of "1" bits; e.g. 255.255.248.0. The configured value is ignored when the IP Address is provided by a BOOTP Server.
  4. Select **Default Gateway**. The IP Address of the Default Gateway can be optionally configured. The configured value is ignored if IP Address and gateway are provided by a BOOTP Server. The configured value must be within the range of the Subnet Mask.

## Configuration Settings for CSCN Routed Bedside Monitors (RBM)

The following settings are used for Customer Supplied Clinical Network (CSCN) Routed Bedside monitors. To access these settings, select the **Bed Label** screen element to call up the **Bed Info** menu.

**IGMP:** Shows status of IGMP Support (On or Off). IGMP (Internet Group Multicast Protocol) is used by many switch manufacturers to limit the number of destinations targeted by a multicast packet.

**CI Mode:** The mode in which CI messages (Connect Indication messages) are sent (Broadcast, Multicast, Manual).

**CI Address:** IP Address for Connect Indication messages only being used if CI Mode is set to Manual. If CI Mode is Broadcast the CI Address is implicitly the subnet broadcast address. If CI Mode is Multicast the CI Address is implicitly 224.0.23.63.

**CI TTL:** Sets the TTL (Time To Live) of the CI message. Defaults to 1.

## Configuring Routed Bedside Monitors Support

An IntelliVue MP2/X2, MP5/MP5T or MP20-90 monitor must be running software revision level G.0 or higher to be used as a routed bedside monitor (RBM).

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### CAUTION

A Philips Routed Bedside Monitor may temporarily stop displaying its Care Group overview bar for up to 60 seconds if a network link carrying multicast traffic between the Philips IntelliVue Information Center and the network routers is lost. While the multicast traffic is being re-routed, the monitor will not display the Care Group overview bar but will maintain connectivity to its associated Philips IntelliVue Information Center. Primary monitoring/alarms will remain available at the Routed Bedside Monitor and its associated Philips IntelliVue Information Center while the multicast traffic is being re-routed.

---

To configure an IntelliVue Patient Monitor to function as an RBM:

1. Put the monitor into Service Mode
2. Select Main Setup => Bed Information => IGMP and set IGMP to On.
3. Select Main Setup => Bed Information => CI Mode and set CI Mode to Multicast.
4. Select Main Setup => Bed Information => CI TTL, and set CI TTL to a value of 8.
5. Store the settings.
6. The CI Address will change to 224.0.23.63.
7. Return the monitor to its normal operational mode.

For further information regarding CSCN Routed Bedside Monitors refer to the CSCN Specifications (P/N: 4535 640 24951)

# Handing Over the Monitor

If you are handing over the monitor to the end-users directly after configuration, make sure that it is in Monitoring mode.

Ensure that the users have access to the following documentation delivered with the monitor:

- Training Program - M8000-9461x - for self-training on the monitor before use
- Instructions for Use - M8000-9001x - for more detailed questions during use

---

**WARNING**

All users must complete the training program (M8105-9441x) and read the Instructions for Use before working with the monitor.

---

These training materials (in combination with this service guide) can also be used to train service personnel on how to use and service monitor.







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# Site Preparation

## Introduction

This section describes the procedures you should follow to plan and prepare a site for an IntelliVue monitor installation. It describes:

- Site planning.
- Roles and responsibilities for local and Philips personnel.
- Remote installation planning.

## Site Planning

The careful planning of the site for the IntelliVue monitor is essential for its safe and efficient operation. *A consulting schedule should be established between the Customer and Philips Sales and Support Representatives, to ensure that all preparations are completed when the system is delivered.*

The site planning phases prior to equipment installation are:

**Location:** Planning the location of the various system components.

**Environment:** Confirming and correcting, as necessary, the environment of the proposed installation site(s).

**System Capabilities:** Explaining the possibilities for system expansion.

**Mounting:** Referencing the mounting hardware information website for the listing of suitable mounting hardware recommended for use with the various system components, and all details on the available mounts and accessories.

**Cabling:** Identifying the requirements for the cabling, conduiting and faceplates for connecting the various system components.

## Roles & Responsibilities

This section describes the procedures necessary to prepare a site for a system installation. The procedures are grouped into two parts: procedures that local staff or contractors are responsible for, and procedures that Philips personnel are responsible for.

### Site Preparation Responsibilities

#### Local Staff

- Ensure that all safety, environmental and power requirements are met.
- Provide power outlets.
- Prepare mounts.
- Pull cables, install conduit, install wallboxes.
- Terminate network cables if a Philips Clinical Network is in use.
- It may be necessary to certify the network cable plant, see Philips Clinical Network Installation Manual for details.

#### Philips Personnel

- Provide the customer with the safety, environmental and power requirements.
- Assemble mounts.
- Prepare monitor remote cabling.

### Procedures for Local Staff

The following tasks must be completed **before** the procedures for Philips personnel may be started.

- Providing Power Outlets

One power outlet for each display and for any peripheral device (for example, a printer or slave display) is required by the system. Provide a power outlet in the vicinity (1 m or 3 ft) of each component that requires power.

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### WARNING

Only the power cables provided with the system may be used. For reasons of safety, power (mains) extension cables or adapters shall not be used.

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- Preparing Mounts

Where ceiling, wall, or shelf mounts are required for mounting the equipment, the customer is responsible for the following:

- Providing and installing all hardware which is required to install the mounting hardware supplied by Philips as detailed in the installation notes.
- Making sure that all ceilings, walls, and mounting rails that supports mounting hardware are suitable for their proposed load.

---

**WARNING**

It is the customer's responsibility to have the attachment of the mounting hardware to the ceiling, wall, or mounting rail and the construction of the ceiling, wall, or mounting rail evaluated for structural integrity and compliance with all local, state and any other required codes by a registered, professional, structural and/or mechanical engineer.

Although considerable effort has been made to ensure the safety of the ceiling mount installation and or mounting guidelines, it is to be understood that the installation itself is beyond the control of Philips Medical Systems. Accordingly, Philips Medical Systems will not be responsible for the failure of any such installation.

---

- Providing Conduit

Where a remote installation is required, for example the installation of a remote display, the customer is responsible for the following hardware installations:

- Providing conduit and/or trunking of a sufficient cross-sectional area for the planned cables and possible future expansion (for additional components or systems). See Cabling Options and Conduit Size Requirements for cable specifications for remote installations.
  - Providing and/or installing suitable wall boxes to accommodate the faceplates.
- 

- Pulling Cables

---

**WARNING**

NEVER run power cables through the same conduit or trunking used for system cables.

---

- Installing Wall Boxes

It is the customer's responsibility to provide and install wallboxes to house faceplates. The customer must notify the Philips installation coordinator of which size is to be used.

**Procedures for Philips Personnel**

Before you begin the procedures in the installation sections, ensure that the customer has completed all necessary preparations outlined in the previous section, "Procedures for Local Staff."

# Monitor M8001A and M8002A Site Requirements

## Space Requirements

The siting of the monitor should be planned such that the nursing staff are able to monitor the patient with relative ease, with all patient connectors and controls readily available and the displays clearly visible. The location should also allow access to service personnel without excessive disruption and should have sufficient clearance all round to allow air circulation.

Dimensions and weight:

Size (W x H x D)

345 x 275 x 230 mm (13.6 x 10.8 x 9 in)

Weight (with M3001A and battery, without options)

6.0 kg (13.2 lb)

## Environmental Requirements

The environment where the MP20/MP30 monitor will be used should be reasonably free from vibration, dust and corrosive or explosive gases. The ambient operating and storage conditions for the MP20/MP30 monitor must be observed. If these conditions are not met, the accuracy of the system will be affected and damage can occur.

### Temperature

Operating: 0 to 40°C (32 to 100°F)

Storage: -20 to 60°C (-4 to 140°F)

#### NOTE

Operation with IntelliVue Instrument Telemetry and battery charging is only allowed at temperatures below 35°C (95°F)

### Humidity

Operating: 20% to 85% Relative Humidity (RH) (non-condensing)

Storage: 5% to 85% Relative Humidity (RH)

### Altitude

Operating: -500m to 3000m (10000 ft.)

Storage: -500m to 12000m (40000 ft.)

## Battery Storage

-20 to 50°C (-4 to 122°F)

## Electrical and Safety Requirements (Customer or Philips)

### Safety Requirements

If the M20/MP30 monitor is to be used in internal examinations on the heart or brain ensure that the monitor is connected to an equipotential grounding system.

#### Grounding

The MP20/MP30 monitor **MUST** be grounded during operation (Class I equipment according to IEC 60601-1). If a three-wire receptacle is not available then the hospital electrician must be consulted to ensure that proper grounding is available on installation. **NEVER** attempt to use a three-wire to two-wire adapter with the MP20/MP30 monitor.

---

### WARNING

Each component must be individually grounded for safety and interference suppression purposes.

---

### Electrical Requirements

#### Line Voltage Connection

The MP20/MP30 monitor uses < 100 W (1.8 to 1.0 A).

#### Line Voltage

The MP20/MP30 monitor may be operated on ac line voltage ranges of 100 to 240V (50/60 Hz).

# Remote Device Site Requirements

The system can be installed with one or more combinations of the following remote devices.

Multi-Measurement Module

Remote Display

Remote Alarm Device

Remote Extension Device (with or without SpeedPoint)

Where more than one site is used for locating equipment (a remote installation), the following sections should be considered for EACH device:

- Space Requirements
- Environmental Requirements
- Mounting
- Electrical and Safety Requirements
- Cabling Options and Conduit Size Requirements



## Connecting Non-Medical Devices

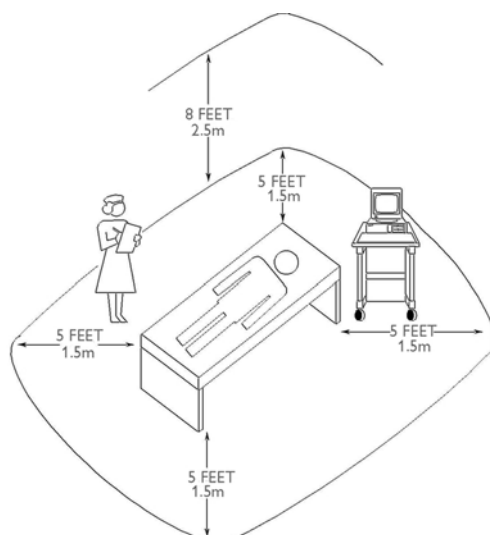
The standard IEC-60601-1-1 applies to any combination of medical and non-medical electrical devices, where at least one is a medical electrical device. Therefore IEC-60601-1-1 must still be met after all devices are connected.

---

### WARNING

Do not use a device in the patient vicinity if it does not comply with IEC-60601-1. The whole installation, including devices outside of the patient vicinity, must comply with IEC-60601-1-1; one reasonable solution may be the use of an isolation transformer. If the monitor is used with battery operation, always use an isolation transformer when connecting an additional display.

---



#### *Equipment Location in the Patient Vicinity*

### NOTE

The site planning requirements, with the exception of the cabling, must be provided by the device manufacturer, if the remote device is not purchased from Philips.

## Multi-Measurement Module (MMS) M3001A and IntelliVue X2 M3002A

### Space Requirements Multi-Measurement Module M3001A

Size (W x D x H)

188.0mm x 96.5 mm x 51.5 mm

(7.40" x 3.80" x 2.03")

Weight

650g (1.4 lb)

**Space Requirements IntelliVue X2 M3002A**

Size (W x D x H)

188.0mm x 99 mm x 86 mm

(7.4" x 3.9" x 3.4")

Weight

1.5 kg (3.3 lb)

**Environmental Requirements Multi-Measurement Module M3001A and IntelliVue X2 M3002A**

Temperature

Operating: 0 to 45°C (32 to 113°F)

Storage: -40 to 70°C (-40 to 158°F)

Humidity

Operating: 95% relative humidity (RH) max. @ 40°C (104°F)

Storage: 90% relative humidity (RH) max. @ 65°C (150°F)

Altitude

Operating: -500m to 4600m (-1600 to 15000 ft.)

Storage: -500m to 15300m (-1600 to 50000 ft.)

**Cabling Options and Conduit Size Requirements**

The following table describes the cabling options for the MMS.

**M8048A and M3001A Cables**

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
Both ends are terminated with straight MSL connectors.					
M8022A #SC1	M3081-61626 453563474781	0.75m Measurement Server to Monitor	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
n/a	M3081-61601 453563402721	1 m Measurement Server to Monitor	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
M8022A #SC2	M3081-61602 453563377851	2m Measurement Server to Monitor	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
M8022A #SC4	M3081-61603 453563402731	4m Measurement Server to Monitor	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
M8022A #SC6	M3081-61627 453563484501	10m Measurement Server to Monitor <sup>a</sup>	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
M8022A #SC7	M3081-61628 453563484511	15m Measurement Server to Monitor <sup>a</sup>	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
M8022A #SC9	M3081-61629 453563484521	25m Measurement Server to Monitor <sup>a</sup>	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
Unterminated Cables					
M3081A #A15	M3081-61615 453563484481	MSL Installation Cable 15m	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
M3081A #A25	M3081-61625 453563484491	MSL Installation Cable 25m	72 mm <sup>2</sup>	40 mm	40 mm x 17 mm
Faceplates					
M3081A #C06	M3081-68708 453563484541	MSL Face Plate US version (pair of connector boxes)	n/a	n/a	n/a
M3081A #C07	M3081-68707 453563484531	MSL Face Plate non-US version (pair of connector boxes)	n/a	n/a	n/a
Insertion Tool					
n/a	M3086-43801 453563484771	MSL Insertion Tool	n/a	n/a	n/a
<sup>a</sup> Built on demand..					

## Mounting

### M3001A Multi-Measurement Module (MMS) and M3002A IntelliVue X2 Mounts

Product Option Number	Part Number 12NC Part No.	Description
M3080A #A01	n/a	Wall Mounting Plate
M8007A #E20	M4046-62501 453563469731	Mount for back of MP60/70

## Remote Displays (M8031A)

### Space Requirements

#### Size (W x D x H)

With mounting bracket: 333mm x 408mm x 85mm (13.1" x 16" x 3.4")

With desk stand: 387mm x 408mm x 175mm (15.2" x 16" x 6.9")

#### Weight

With mounting bracket: 4900g (10.8lb)

With desk stand: 6900g (15.2lb)

### Environmental Requirements

#### Temperature

Operating: 5 to 45°C (41 to 113°F)

Storage: -20 to 60°C (-4 to 140°F)

#### Humidity

Operating: 95% RH max @ 40°C (104°F)

Storage: 85% RH max @ 50°C (122°F)

#### Altitude

Operating: Up to 4600m (15000 ft.)

Storage: Up to 4600m (15000 ft.)

### Electrical and Safety Requirements

#### Voltage ranges:

90V to 264V

#### Voltage selection:

Wide range input, no voltage selection required

Max. Power consumption: 40W

## Remote Displays (M8031B)

### Space Requirements

#### Size (W x D x H)

372mm x 308mm x 74.1mm (14.65" x 12.13" x 2.92")

#### Weight

Without deskstand: 5200g (11.5lb)

With desk stand: 9000g (19.8lb)

### Environmental Requirements

#### Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 60°C (-4 to 140°F)

#### Humidity

Operating: 20 to 85% RH (Non-condensing)

Storage: 5 to 85% RH (Non-condensing)

#### Altitude

Operating: Up to 4000m (13123.36 ft.)

Storage: Up to 12000m (39370.08 ft.)

### Electrical and Safety Requirements

#### Voltage ranges:

90V to 264V

#### Voltage selection:

Wide range input, no voltage selection required

Power consumption: ~30W

## Remote Displays - M8033A

### Space Requirements

#### Size (W x H x D)

Landscape mode: 457mm x 457mm x 216mm (18" x 18" x 8.5")

Portrait mode: 457mm x 495mm x 216mm (18" x 19.5" x 8.5")

Weight: 8.9 kg (20 lbs)

### Environmental Requirements

#### Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 60°C (-4 to 140°F)

#### Humidity

Operating: 10 to 90% RH (Non-condensing)

Storage: 10 to 90% RH (Non-condensing)

#### Altitude

Operating: Up to 2400m (8000 ft.)

Storage: Up to 12200m (40000 ft.)

### Electrical and Safety Requirements

#### Voltage ranges:

90V to 264V (13.5A fuse)

#### Voltage selection:

Wide range input, no voltage selection required

Power consumption: 60 watts maximum

## Remote Displays - M8033B

### Space Requirements

#### Size (W x H x D)

404mm x 401mm x 234mm (15.9" x 15.8" x 9.2")

#### Weight

Without deskstand: 4.8 kg (10.6 lbs)

With deskstand: 8.8 kg (20 lbs)

### Environmental Requirements

#### Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 65°C (-4 to 140°F)

#### Humidity

Operating: 10 to 90% RH (Non-condensing)

Storage: 10 to 90% RH (Non-condensing)

#### Altitude

Operating: Up to 2438m (8000 ft.)

Storage: Up to 12192m (40000 ft.)

### Electrical and Safety Requirements

#### Voltage ranges:

100V to 240V

#### Voltage selection:

Wide range input, no voltage selection required

Power consumption: 50 watts maximum

## Remote Displays - M8033C

### Space Requirements

#### Size (W x H x D)

410mm x 362mm x 103mm (16.1" x 14.25" x 4.1")

#### Weight

Without deskstand: 7 kg (15.4 lbs)

With deskstand: 10.8 kg (20 lbs)

### Environmental Requirements

#### Temperature

Operating: 0 to 40°C (32 to 104°F)

Storage: -20 to 60°C (-4 to 140°F)

#### Humidity

Operating: 20 to 85% RH (Non-condensing)

Storage: 5 to 85% RH (Non-condensing)

#### Altitude

Operating: Up to 4000m (8000 ft.)

Storage: Up to 12000m (40000 ft.)

### Electrical and Safety Requirements

#### Voltage ranges:

90V to 264V

#### Voltage selection:

Wide range input, no voltage selection required

Power consumption: 60 watts maximum

### Cabling Options and Conduit Size Requirements

The following table describes the cabling options for the M8031A/B 15" and the M8033A/B/C 17" TFT Medical Grade Touch Displays.



**Analogue Video Cables**

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
M8022A #VA2	M3080-61606 453563484451	1.5m Analogue Video Cable Kit	64 mm <sup>2</sup>	40 mm	35 x 16 mm
M8022A #VA3	M3080-61602 453563334661	3m Analogue Video Cable Kit	64 mm <sup>2</sup>	40 mm	35 x 16 mm
M8022A #VA6	M3080-61603 453563334671	10m Analogue Video Cable Kit <sup>a</sup>	64 mm <sup>2</sup>	40 mm	35 x 16 mm
M8022A #VA7	M3080-61607 453563484461	15m Analogue Video Cable Kit <sup>a</sup>	64 mm <sup>2</sup>	40 mm	35 x 16 mm
M8022A #VA9	M3080-61608 453563484471	25m Analogue Video Cable Kit <sup>a</sup>	64 mm <sup>2</sup>	40 mm	35 x 16 mm
M1181A #A78	M1181-61695 453563255281	3m XGA Video Cable with right-angled connector. Patient Monitor to display.			
M1181A #A79	M1181-61698 453563255291	10m XGA Video Cable with right-angled connector. Patient Monitor to display.			
Both ends are terminated with HDSUB15 (“VGA”) straight connectors					
<sup>a</sup> Built on demand					

**Touch Cable**

Product Option Number	Part Number	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
M8022A #TC2	M8081-61010 451261006551	Touch Cable, 1.5m	30mm <sup>2</sup>	25mm	35 x 16 mm
M8022A #TC3	M8081-61011 451261006561	Touch Cable, 3m	30mm <sup>2</sup>	25mm	35 x 16 mm
M8022A #TC6	M8081-61012 451261006571	Touch Cable, 10m	30mm <sup>2</sup>	25mm	35 x 16 mm
M8022A #TC7	M8081-61013 451261006581	Touch Cable, 15m	30mm <sup>2</sup>	25mm	35 x 16 mm
M8022A #TC9	M8081-61014 451261006591	Touch Cable, 25m	30mm <sup>2</sup>	25mm	35 x 16 mm

## Remote Alarm Devices

### Space Requirements

#### Size (W x D x H)

62mm x 125mm x 63 mm (2.4" x 5" x 2.5")

#### Weight

< 300 g (< 0.7 lb)

### Mounting

#### Remote Alarm Device Mounting

Note that the Universal Mounting Clamp (5061-8363) must be ordered separately

Product Option Number	Part Number	Description
n/a	M8026-64001 451261006641	Wall Mount

### Cabling Options and Conduit Size Requirements

The following table describes the cabling options for the Remote Alarm Device M8025A.

#### M8025A Remote Alarm Device Cables

Product Option Number	Part Number	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
M8022A #HF2	M8086-61003 453563484641	1.5m Monitor to Remote Device	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF3	M8086-61004 453563484651	3m Monitor to Remote Device	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF6	M8086-61005 453563484661	10m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF7	M8086-61006 453563484671	15m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF9	M8086-61007 453563484681	25m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
Both ends are terminated with straight MDR connectors.					
<sup>a</sup> Built on demand.					

## Remote Extension Device

### Space Requirements

**Size (W x D x H):**

103mm x 139mm x 63 mm (4" x 5.5" x 2.5")

**Weight:**

< 400 g (< 0.9 lb)

### Mounting

#### *Remote Extension Device Mounting*

Product Option Number	Part Number	Description
n/a	M8026-64001 451261006641	Wall Mount
n/a	M8026-64002 451261015161	Mount to FMS

### Cabling Options and Conduit Size Requirements

The following table describes the cabling options for the M8026A Remote Extension Device.

#### *M8026A Remote Input Extension Device Cables*

Product Option Number	Part Number	Description	Conduit Sizes	Bend Radius	Connector Size (L x W)
M8022A #HF2	M8086-61003	1.5m Monitor to Remote Device	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF3	M8086-61004	3m Monitor to Remote Device	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF6	M8086-61005	10m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF7	M8086-61006	15m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
M8022A #HF9	M8086-61007	25m Monitor to Remote Device <sup>a</sup>	30 mm <sup>2</sup>	30 mm	27 x 13 mm
Both ends are terminated with straight MDR connectors.					
<sup>a</sup> Built on demand.					

## Input Devices

The following tables describes the input devices which can be connected to the Remote Extension Device M8024A, or directly to the monitor.

### ***M8024A Input Devices***

Product Option Number	Part Number	12NC Part Number	Description
M8024A #A02	-	-	Slimline Keyboard/Trackball USB
	-	453564115901	Keyboard French Trackball USB
	-	453564115911	Keyboard Italian Trackball USB
	-	453564115921	Keyboard German Trackball USB
	-	453564115931	Keyboard Danish Trackball USB
	-	453564115941	Keyboard Swedish Trackball USB
	-	453564115951	Keyboard English Trackball USB
	-	453564119161	Keyboard Spanish Trackball USB
M8024A #A03	-	-	Compact Keyboard USB
	-	453564115961	Keyboard French standard USB
	-	453564115971	Keyboard Italian standard USB
	-	453564115981	Keyboard German standard USB
	-	453564115991	Keyboard Danish standard USB
	-	453564116001	Keyboard Swedish standard USB
	-	453564116011	Keyboard English standard USB
	-	453564119171	Keyboard Spanish standard USB
M8024A #B01	M4046-60104	451261000661	Optical Mouse USB PS/2
M8024A #C02	M4046-60105	451261000671	Wireless Track Ball USB PS/2
M8024A #C03	M4046-60106	451261000681	Wired Track Ball USB PS/2
M8024A #C04	-	453564119281	Wireless Off Table Mouse

## Local Printer

See printer documentation

# Philips Medical LAN

For information refer to the IntelliVue Information Center documentation.

## Wireless LAN Adapter Cable

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius
M8022A #WL0	M8080-61001	~30cm	30 mm <sup>2</sup>	30 mm
	453563484581	Y-piece; DC supply plus LAN for Wireless Ethernet Adapter and IIT Adapter		
n/a	M2639-61001 451261013011	Cable Assembly Mini Din 8 Pin 1:1r for IntelliVue 802.11 Bedside Adapter		

# RS232/MIB/LAN Interface

## MIB Cable and Serial Cable

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Max. Bend Angle	Connector Size (L x W)
M8022A #SR2	M8081-61001 453563484591	1.5m cable	30 mm <sup>2</sup>	25 mm	15 x 15 mm
M8022A #SR3	M8081-61002 453563484601	3m cable	30 mm <sup>2</sup>	25 mm	15 x 15 mm
M8022A #SR6	M8081-61003 453563484611	10m cable	30 mm <sup>2</sup>	25 mm	15 x 15 mm
M8022A #SR7	M8081-61004 453563484621	15m cable	30 mm <sup>2</sup>	25 mm	15 x 15 mm
M8022A #SR9	M8081-61005 453563484631	25m cable	30 mm <sup>2</sup>	25 mm	15 x 15 mm
Both ends are terminated with 8 pin RJ45 connectors. CAT5 cable; straight through wiring.					

**Cable and Adapter Set**

## Nurse Call Relay Interface

**Nurse Paging Cable**

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius	Connector Size
M8022A #NC3	M1181-61648 453563375601	3m traditional nurse paging relay cable.  One end terminated with phone plug, one end without connector.	13 mm <sup>2</sup>	20 mm	Diameter 12 mm
M8022A #NC6	M8087-61001 453563484741	10m flexible nurse paging cable.  One end terminated with straight MDR connector, one end without connector.	40 mm <sup>2</sup>	30 mm	35 x 16 mm

## ECG Out Interface

**ECG Out Cable**

Product Option Number	Part Number 12NC Part No.	Description	Conduit Sizes	Bend Radius	Connector Size (Diameter)
M8022A #A62	8120-1022 453563198151	3m cable (Both ends are terminated with .25" phone plugs)	40 mm <sup>2</sup>	30 mm	13 mm
n/a	M1181-61625 453563255091	cable kit consisting of: 25 m raw cable, 2 x 1/4" socket, 1 x 1/4" plug			







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# Gas Analyzers

For details on the M1026A/B Anesthetic Gas Module, the M1013A IntelliVue G1 and the M1019A IntelliVue G5, please refer to the respective Service Guides on your documentation CD.

For details on configuring the RS232/MIB port for the gas analyzers, see *Connection of Devices via the MIB/RS232 Interface* in the Installation Instructions chapter



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